



SATURDAY, AUGUST 15, 1874.

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CATECHISM OF THE LOCOMOTIVE.

By M. N. FORNEY, Mechanical Engineer.

PART XVIII—CONTINUED.

COMBUSTION.

QUESTION 370. Does any combustion take place after the gases enter the tubes?

Answer. Very little; as the flames are extinguished soon after they enter.

QUESTION 380. Why are the flames extinguished in the tubes?

Answer. They are then in contact with large quantities of incombustible gas and beyond the reach of a supply of air; besides, the temperature of the tubes which are surrounded with water is so low that the flame is soon cooled down below an igniting temperature.

QUESTION 381. What temperature is necessary to ignite coal gas or produce flame?

Answer. A temperature considerably hotter than red-hot iron is needed, as can easily be shown by the fact that a gas light cannot be ignited with a red-hot poker.

QUESTION 382. Are there any parts of the fire-box where the temperature is probably below the igniting point?

Answer. Yes; along the sides and ends near the plates which are covered with water on the opposite side. At these points the coal is usually "dead" or incandescent, as it remains at too low a temperature to burn. For this reason, in some cases a space of from 8 to 12 inches on each side, and still more at the ends of the grates, is made of solid plates, without any openings, and therefore called "dead grates," so that no cold air can enter at those points. These plates are made sloping downwards from the sides towards the center of the fire-box, so that the coal which falls on them and is thus coked can easily be raked towards the middle of the fire. This arrangement of dead plates often improves the combustion and results in greater economy of fuel. The reduction of the area of the openings between the grate-bars can be compensated by making the bars narrower or the spaces between them wider.

QUESTION 383. What should be the condition of the coal when it is put on the fire?

Answer. It is true of the coal as well as of the gases that the chemical action between it and the oxygen can only take place when the two are in intimate contact, and therefore the rapidity and completeness of combustion and intensity of heat will be increased by increasing the number of points of contact, or by reducing the size of the fuel. The coal should therefore be broken up, but not so small as to fall between the grate-bars or be carried out of the fire-box by the blast.

QUESTION 384. What amount of air must be admitted to the fire to effect perfect combustion?

Answer. It was stated that average bituminous coal contains about 80 per cent. of carbon, 5 per cent. of hydrogen and 15 per cent. of other substances. As a large proportion of the latter are incombustible, we will confine ourselves for the present to the consideration of the combustion of the hydrogen and carbon alone.

The hydrogen, as has been explained, unites with oxygen in the proportion by weight of 1 part of the former to 8 parts of the latter, and the product of this union is water, or steam. As 36 parts of air contain only 8 of oxygen, IN ORDER TO BURN THE HYDROGEN IT MUST BE SUPPLIED WITH 36 TIMES ITS WEIGHT OF AIR.

In order to burn the carbon perfectly it must, as has been explained, be converted into carbonic dioxide, which consists of 6 parts of carbon and 16 of oxygen, and as air contains 28 parts of nitrogen to every 8 of oxygen, we must furnish 72 parts of air to every 6 of carbon, or in other words, CARBON REQUIRES 12 TIMES ITS WEIGHT OF AIR FOR ITS PERFECT COMBUSTION.

Every pound of average bituminous coal, therefore, requires 1.8 lbs. of air to burn its hydrogen, and 9.6 lbs. for the carbon, or 11.4 for both. As a portion of the other substances of which coal is composed, besides the oxygen and hydrogen, which others have been classed as impurities, are combustible, there will be no material error if we estimate the amount of air required for the combustion of bituminous coal at 12 POUNDS PER POUND OF FUEL. As each cubic foot of air weighs 0.08072 lb.,

12 lbs. will be equal to $\frac{12}{0.08072} = 148.6$ cubic feet of air, or for

the sake of even figures and a quantity which can easily be remembered, we will say 150 CUBIC FEET OF AIR ARE NEEDED FOR THE COMBUSTION OF EACH POUND OF COAL. This is the theoretical quantity of air which is needed for combustion. Now unfortunately the process of combustion in the fire-boxes of locomotives is one in which any very exact combustion of the substances which unite is not possible with the appliances which are now employed. If, therefore, we admitted the exact amount of air given above, while some portions of the fire where combustion was not very active might have more air than is needed, other portions would have too little, and if the air is not very thoroughly mixed the flame and burning coal may be surrounded with the products of combustion, which would exclude the air and thus reduce its effect upon the fire. For this reason, besides the air required to furnish the oxygen necessary for the complete combustion of the fuel, it is also necessary to furnish an additional quantity of air for the dilution of the gaseous products of combustion, which would otherwise prevent the free access of air to the fuel. The more minute the division and the greater the velocity with which the air rushes among the fuel the smaller is the additional quantity of air required for dilution. In locomotive boilers, although this quantity has not been exactly ascertained, there is reason to believe that it may on an average be estimated at about one-half of the air required for combustion.* We would therefore have as the quantity of air needed for combustion

$$150 + \frac{150}{2} = 225 \text{ cubic feet.}$$

This estimate is roughly made, but it is the nearest approximation at present attainable. It is probable that the supply of air required for dilution varies considerably in different arrangements of the fire-box and for different kinds of fuel, and it is possible that by admitting the air for combustion in small enough jets, and deflecting the currents of smoke and gases so as to cause them to mingle with the air, the quantity required for dilution might be reduced below that indicated by the above calculation. Undoubtedly all the air which is admitted into the fire-box which does not combine with the chemical elements of the fuel lessens the amount of steam generated in the boiler, both with reference to time, that is to say per minute, and to fuel, that is per pound of coal consumed. But with the present locomotive boiler it is simply a choice of two evils. If no more air is admitted than theory indicates to be needed for combustion, then, owing to the imperfect means which are usually employed to cause the air and fuel to combine, a portion of the latter will escape unconsumed; and if more air is admitted, the temperature of the products of combustion is lowered and their volume increased, the evils of which have already been pointed out. It therefore becomes a matter in which we are obliged to consult experience and determine by experiment what amount of air it is necessary to admit to the fuel to produce the most economical results.

QUESTION 385. What proportion of the air should be admitted through the grate and how much above the fire?

Answer. This, too, is a question which can probably be answered best by consulting experience. The relative quantity of air required above and below the fire depends very much on the nature of the fuel. Coal which "runs together" or cakes very much or has a great deal of clinker in it, doubtless, will need more air above the fire than other coal which is said to be "drier," for the reason that it will be found impossible to admit so much air through the caking coal in the grate as through the other kind. An idea of the relative quantity which should be admitted above and below the fire may be found if we know how much air is needed to burn the solid carbon or coke which is left after the gas is expelled from it, and how much for the gas itself. The gas which is expelled from a pound of coal consists of about 0.05 lb. of hydrogen and 0.15 lb. of carbon. Now it has been shown that hydrogen requires 36 times its weight of air to burn it perfectly, so that 0.05 lb. would need $0.05 \times 36 = 1.8$ lbs.; and carbon requires 12 times its weight of air, so that for 0.15 lb. of carbon $0.15 \times 12 = 1.8$ lbs. is needed, so that for both 3.6 lbs. of air is required for perfect combustion. As has been shown, 12 lbs. is needed to consume the whole of the fuel, so that 30 per cent. of the whole supply is required for the combustion of the gas alone. If this is diluted in the same proportion as that required for the combustion of the carbon, and it probably should be even more so, we would have 30 per cent. of $225 = 67.5$ cubic feet of air required for the combustion of the gas. It is certain, however, that the solid coke on the grates is not perfectly consumed, or in other words converted into carbonic dioxide, especially when the layer of it on the grates is very thick. When this is the case the air coming in contact with the lower layer of coke forms carbonic dioxide, but as it rises through the burning coke another equivalent of carbon unites with the carbonic dioxide, and thus forms carbonic oxide. If now enough air is admitted above the fire this carbonic oxide will combine with it, and as has been explained before, a second combustion will take place if there is time and opportunity for combination before the gases enter the flues. It is therefore probable that more than 30 per cent. of the whole supply of air should be admitted above the fire. It is at any rate best to provide the means for admitting more, and also appliances for regulating the supply, so that it can be governed as experience may indicate to be best.

QUESTION 386. Is it not possible by enlarging the grate to admit enough of air to the fire to produce perfect combustion?

Answer. Yes; when no air is admitted above the fire large grates are found to produce the best combustion. But while it is true that the same amount of heat will be produced by the union of each equivalent of oxygen and fuel, yet if we can force more air and fuel to unite in the same place, a higher temperature is produced in that place, just as a fire in a blacksmith's forge is hotter because of the forced blast than that in an ordinary stove, or a smelting furnace than a parlor grate. If, then, we can concentrate the draft in the fire of a locomotive we secure a greater intensity of combustion, and when the air is urged against the solid carbon with considerable force, it comes in contact with every point of its surface, and therefore less dilution of the air is needed, and consequently the products of combustion have a higher temperature, and, as has been explained, a larger proportion of the heat is then transferred to the water than if the temperature is lower and the volume greater.

Intensity of combustion also has the effect of maintaining an igniting temperature, whereas if the same amount of fuel is burned slowly its heat may not be high enough to ignite the gases as they are produced. It is desirable, however, to have all the space that is possible in the fire-box, so as to give room for the mixing of the gases; but with a large fire-box and large grate a decided improvement and economy will often result by diminishing the effective area of the grate by covering

* Rankine.

a part of it with dead plates, but at the same time making provision for the admission of air above the fire.

QUESTION 387. What is meant by the "Total Heat of Combustion?"

Answer. It is the number of units of heats given out by the combustion of a given quantity (usually a pound) of fuel.

QUESTION 388. How is this determined?

Answer. The heat given out by the combustion of one pound of the chemical elements of which coal is composed has been determined by experiment, and from such data, knowing the substances of which fuel is composed, we can determine the amount of heat which would be developed if they were each perfectly consumed. Thus the total heat of combustion of one pound of hydrogen is 62,082 units, and of the same quantity of carbon 14,500 units.† Therefore if a pound of coal contains 5 per cent. of hydrogen, the heat given out by the combustion of that element will be $62,082 \times 0.05 = 3,104.10$ units, and if it has 80 per cent. of carbon, the combustion of the latter would develop $14,500 \times 0.80 = 11,600$ units, so that the total heat of the combustion of these two elements would be $3,104.1 + 11,600 = 14,704.1$ units. It was shown in answer to Question 39 that it required 1,216.9 units of heat to convert water at zero to steam of 100 lbs. pressure. As steam is usually generated from water at a temperature of about 60 degrees, the total heat required to convert it into steam of 100 lbs. pressure would be $1,216.9 - 60 = 1,156.9$ units. A pound of average bituminous coal, therefore, contains heat enough to convert $12\frac{1}{2}$ pounds of water into steam of 100 lbs. absolute pressure. Ordinarily only about half that amount of water is evaporated per pound of fuel.

QUESTION 389. What are the chief causes of this waste of heat?

It is due, first, to the waste of unburnt fuel in the solid state. This occurs when fuel which is very fine falls through the grates, or is carried through the tubes and out of the stack in the form of cinders.‡

Second, to the waste of unburnt fuel in the gaseous or smoky state. The method of preventing this waste by a sufficient supply and proper distribution of air has been stated in the answer to preceding questions.

Third, to the waste or loss of heat in the hot gases which escape up the chimney or smoke stack. The temperature of the fire in a locomotive fire-box in a state of active combustion is probably from 3,000 to 4,000 degrees. This heat is in part radiated and conducted to the heating surface of the fire-box, and it is found that more water is evaporated by this portion of the heating surface in proportion to its area than by any other in the boiler. The gases when they enter the tubes transmit a portion of their heat to the surfaces with which they are first in contact. The amount of heat thus transmitted, as has been stated, is in proportion to the difference in temperature of the gases inside the tubes and that of the water outside. After passing over the part of the tube with which the gases are first in contact they then arrive at another portion of the tube surface with a diminished temperature, and the rate of conduction is therefore diminished; so that each successive equal portion of the heating surface transmits a less and less quantity of heat, until the hot air at last leaves the heating surface and escapes up the chimney with a certain remaining excess of temperature above that of the water in the boiler, the heat corresponding to which excess is wasted.§ It is, therefore, desirable to extract as much heat as possible from the gases before they escape from the tubes. Now it will be impossible to heat the water outside of the tubes hotter than the gases inside. When the temperature of the water is equal to that of the gases, no more heat will be transmitted from one to the other. If the temperature of the water is 350 degrees, that of the gases in the tubes will never be any lower, but will escape into the smoke-box with that amount of heat. If, however, the cold water is introduced at the front end of the tubes, so that the surface with which the gases are last in contact has a temperature considerably lower than 350, then an additional amount of heat will be transmitted before they escape. It is, therefore, important that the cold feed-water should be admitted near the front end of the boiler, so that the products of combustion will be in contact with the coldest part of the heating surface last, and thus give out as much of their heat as possible before they escape. As a matter of fact, the gases escape at a much higher temperature. Experiments made by the writer showed that at starting the temperature in the smoke-box of a locomotive when first starting was 270 degrees, and when working at its maximum capacity on a steep grade and with a heavy train it was as high as 675 degrees. The average temperature while running was, in three trials on different parts of the road, as follows:

Average steam pressure, 98.8 lbs.; average temperature, 499.8 lbs.
Average steam pressure, 116 lbs.; average temperature, 535.1 lbs.
Average steam pressure, 112.2 lbs.; average temperature, 554 lbs.

It will thus be seen that a great deal of heat is wasted by escaping up the chimney.

Fourth, by external radiation from the boiler. This occurs chiefly from the fact that it is not sufficiently well protected or covered with non-conducting material. The practice, or rather the neglect, of not covering the outside of the fire-box with lagging doubtless causes a very considerable loss of heat by radiation and convection from the hot boiler plates.

QUESTION 390. What is the ordinary form of fire-box employed for burning bituminous coal?

Answer. It is that represented in figs. 41 and 44, and is simply a rectangular box, and for that reason it is called a plain fire-box. Sometimes provision is made for admitting air into such fire-boxes through hollow or rather tubular stay-bolts,

† The experiments which have been made to determine these amounts do not agree exactly, but those given are thought to be the most trustworthy.

‡ It should be remarked here that some and perhaps most of the cinders which are carried out of the stack are not combustible but are composed of the same materials which form cinders.

§ Rankine.

which are put into the sides and front. In most cases, too, the fire-box door has perforations for admitting air.

QUESTION 391. What other appliances are used for burning bituminous coal?

Answer. The most common appliance which is added to the plain fire-box is what is called a *fire-brick arch*. This is shown in fig. 214. *B C* is the arch, which, as its name implies, is formed of fire-brick and extends backward and upward from a point in the tube-sheet below the tubes. In order to be self-supporting it is built in the form of an arch, the two sides of the fire-box acting as abutments for its support. The engraving represents with sufficient clearness the direction of the flames and smoke. These must take a more circuitous "run," as it is called, after leaving the fire in order to reach the tubes. Time is thus given for the gases to combine and combustion to take place. The fire-brick becomes heated, and thus prevents the gases from being cooled down below an igniting temperature by contact with the cold surface of the fire-box before combustion takes place. The fire-brick, however, soon burns out, and must be replaced, but owing to its cheapness and the ease with which it can be removed, this does not make a serious objection to its use. Air is nearly always admitted above the fire when the brick arch is used, either by tubular stay-bolts, *a, a, a*, or perforations in the door or both.

In order to avoid the inconvenience and expense of replacing the fire-brick arch, what is known as the "*Jauriet water-table*" has been extensively used on some roads. This is the invention of Mr. C. F. Jauriet and is represented in fig. 215, and consists of a flat "table," *B C*, formed of two boiler plates placed about $4\frac{1}{2}$ in. apart, with the space between filled with water. The two plates are stayed with ordinary stay-bolts in the same way as the sides of the fire-box. The form of the

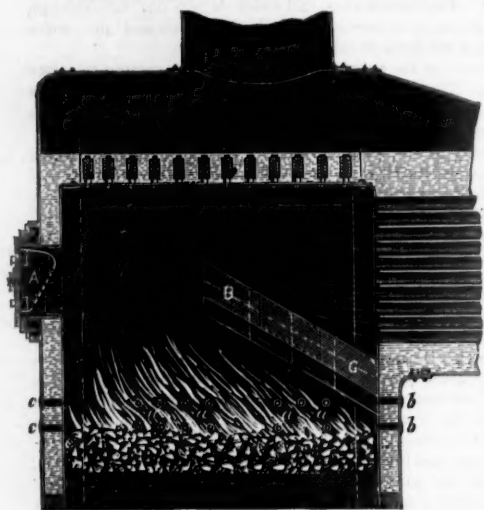


Fig. 214.

water-table is similar to that of the fire-brick, excepting that it is not arched, this form not being necessary, as the plates are riveted to the sides of the fire-box. Air is admitted above the fire both by hollow stay-bolts and holes in the door, as shown at *A*. Tubes, *f*, are put into the front and lower portion of the water table to allow the ashes and cinders, which would otherwise be deposited above, to fall down on the grates.

When air is admitted at the furnace door of an ordinary fire-box, it is very apt to rush directly into the tubes without mingling with the gases. It was found by some of the firemen on English railroads that by placing a shovel over the top of the furnace door the current of air which entered could thus be deflected downward, and in this way smoke could be almost entirely prevented. This led to the adoption of a hood or deflector, fig. 216, which is made of sheet iron and is placed over the fire-box door and is arranged with a lever, *B*, so that it can be raised in order to be out of the way when coal is thrown on the fire. It is suspended from a hook, *C*, from which it can easily be detached and taken out for repairs. This is frequently necessary, as the intense heat of the fire-box burns away the sheet iron of which it is made very rapidly. It can be made of old boiler plate, so that the expense of renewal is very slight. When this plan is used a double sliding door shown in fig. 217 is commonly used with it. These doors are opened by the levers *f d*, and *e f*, which are all connected together. With these sliding doors the opening for the admission of air can easily be regulated, and the opening through which the lever, *B*, is attached to the deflector, *A*, can be arranged more conveniently than with a swinging door. This plan has been employed by the Rogers Locomotive Works.

Another plan, which was designed and patented by Mr. William Buchanan, Master Mechanic of the Hudson River Railroad, and used extensively on that line, is shown in fig. 218. This consists of a water-table, but it extends completely across the fire-box from the tube-sheet to the back-plate, thus dividing the fire-box into two compartments, *M* and *N*. In order to afford communication from the lower one to the upper one a round hole, *D*, about 24 in. in diameter, is put in the water-table in the position shown. It will thus be seen that all the currents of gas, smoke and air must unite in passing through this opening, and are thus brought into close contact with each other. After they enter the upper chamber and before they enter the tubes, there is room and time for combustion. The position of the lower side of the table, it will be seen, is similar to that of the deflector shown in fig. 216, so that it acts in somewhat the same way, by directing the currents of air downward on the fire.

QUESTION 392. How do these different plans operate?

Answer. They all give very excellent results, if managed with care. It is probable, however, that more economy in the consumption of coal would result from the improvement of the practice and knowledge of firemen than can be expected from the use of any of the appliances described, if they are used without care, or knowledge of the principles of combustion.



Fig. 218.

QUESTION 393. In what respect does anthracite coal differ from bituminous?

Answer. It differs chiefly in the fact that it contains a much larger proportion of carbon and less of hydrogen, and in the fact that it consequently gives off very little or no coal gas. Its combustion is therefore more simple than that of bituminous coal, as there is very little else than solid carbon to burn.

QUESTION 394. In what kind of a fire-box is anthracite usually burned?

Answer. It is usually burned in a very long grate, and as the heat is very intense, the grate-bars are made of iron tubes, through which a current of water circulates, so as to prevent them from melting.

QUESTION 395. Is it important to admit air above an anthracite fire to facilitate combustion?

Answer. As there are no gases to be burned, it is not so important as it is with bituminous coal, but if the layer of anthracite on the grates is very thick, it will be impossible to get enough air through the coal to convert all the carbon into carbonic dioxide, and the carbon and oxygen will therefore unite so as to form carbonic oxide. If air is admitted above the fire, as has already been explained, another equivalent of oxygen will unite with the carbonic oxide, and a second combustion will then take place above the fire, and the carbonic oxide will thus be converted into carbonic dioxide. If under these circumstances no air was admitted above the fire the second combustion would not occur, and all the heat produced thereby would be lost.

Fig. 216.

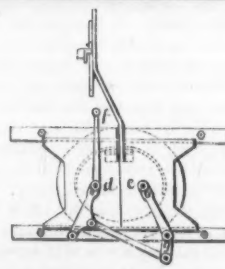
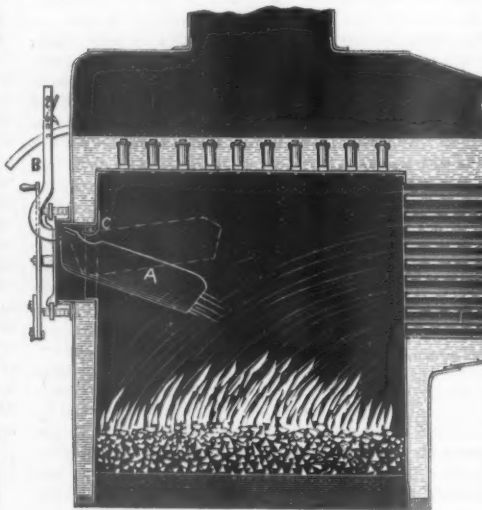


Fig. 217.

QUESTION 396. How can we determine the relative value of different kinds of fuel for use in locomotives?

Answer. This can only be determined satisfactorily by actual experiment. The chemical composition, excepting so far as

it indicates the presence of deleterious substances, such as sulphur, ashes, clinkers, etc., affords but little assistance in determining the value of fuel. Nearly the same quantities of elements in different fuels may arrange themselves before and during combustion, so as to produce very different series of compounds. It is true that the composition of coal gives us some indication of its heat-producing capacity, but the extent to which that capacity can be converted into actual steam in locomotive boilers depends to a very great extent upon the conditions under which the fuel is burned. It should also be remembered that the rapidity with which steam can be generated is a very important matter in locomotive practice. Whether a heavy freight train can be taken up a given grade or a fast express make time often depends upon the amount of steam which can be generated by the fuel in each second when the boiler is worked at its maximum capacity. It is of course often necessary to adapt the appliances for burning fuel to the fuel itself, and when a poor quality of the latter must be used more boiler capacity must be given than is needed to do the same work with better fuel.

The following table will, no doubt, be valuable as indicating the properties and relative value of several different kinds of fuel used in this country. The table is copied from a report made to the Navy Department of the United States by Professor Walter B. Johnson in 1844, and the conclusions are deduced from a series of very elaborate experiments made for the Navy Department. This report furnishes the most full and reliable data regarding the value of American fuel thus far (1874) published, but it contains little or no information concerning the fuels which are now used on railroads in our Western States. The first eight specimens of coal given in the table are anthracite, all the rest are bituminous coals.

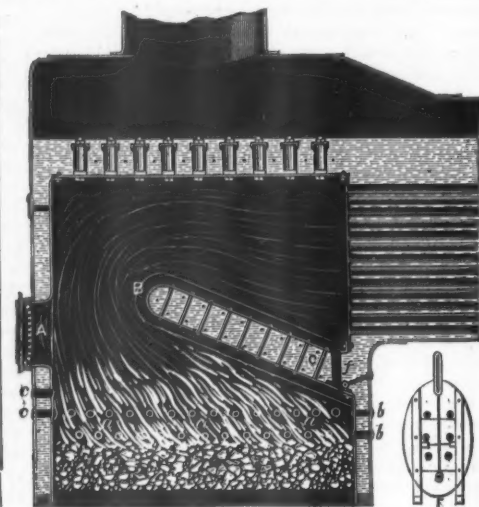


Fig. 215.

ANNUAL REPORTS.

Central Pacific.

An analysis of the report for the year 1873 gives the following facts:

The lines owned by the company are:	Miles.
Main Line—San Francisco to Ogden.....	882.89
Oregon Division—Roseville to Redding.....	161.45
Visalia Division—Lathrop to Goehsen.....	146.39
Oakland and Alameda Branches—	
Oakland Wharf to Brooklyn.....	5.67
Oakland Point to Mastick's.....	3.79
Alameda Wharf to Melrose.....	8.19
San Leandro to Hayward's.....	6.10
San Jose Branch—Niles to San Jose.....	20.75
.....	17.54

Total.....1,218.93

During the year the 3.79 miles of the line from Oakland Point to Mastick's was constructed, and 6.42 miles of the Oakland and Alameda Branch, near to and almost parallel with the main line from Melrose to Hayward's, was taken up, making the length of the road 2.63 miles less at the close than at the beginning of the year.

This road, all single track, has 140.89 miles of sidings, making 1,460 miles of track owned by the company.

The company also worked under a lease the 41.2 miles of the Southern Pacific Railroad which forms an extension of the Visalia Division southward. Of this 20.3 miles was not completed until July 1, so that its average length was 31.05 miles, and the average length worked by the Central Pacific Company was 1,250 miles.

The road is worked by 188 locomotives; 92 first-class, 59 second class and 23 sleeping coaches, 19 mail and express and 21 baggage cars, making 207 passenger-train cars; 55 caboose, 2,040 box, 1,499 platform and 110 dump cars, or 3,704 freight cars; and 1 directors', 1 superintendent's, 1 pay, 170 section, 52 track-laying and 2 wrecking cars and 7 snow-plows, or 234 service cars; besides 212 hand cars. The additions were 3 locomotives (12 new ones built at the company's works and 9 sold), 15 caboose, 464 box and 5 flat cars. Forty platform cars are equipped with tanks and used as water cars.

The company had originally a land grant of 11,722,400 acres, of which down to the close of 1873 there had been sold 309,136.24 acres, at an average price of a little more than \$4.12½ per acre, making the sum \$1,459,768.38. The sales for 1873 were 58,738.6 acres for \$410,315, or \$7 per acre.

The stock and funded debt is:	
Capital stock (\$44,525 per mile.....)	\$54,378,500
Bonded debt:	
Convertible mortgage 7s.....	\$1,483,000
State aid 7s.....	1,500,000
First mortgage 6s.....	25,883,000
Western Pacific 6s.....	2,735,000
Cal. & Oregon 6s.....	6,000,000
Cal. & Or. Div. 6s.....	1,066,000
S. F. Oakland & Alameda 6s.....	800,000
San Joaquin Valley 6s.....	6,080,000
Land grant 6s.....	9,183,000

Total (\$44,627 per mile).....54,400,000

Government bonds (\$22,851 per mile).....27,855,000

The Government bonds are a second mortgage on the 832 miles from San Francisco to Oakland, whose interest and



Published Every Saturday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

GRAIN EXPORTS.

We called attention a few weeks ago to the probable heavy movement of traffic soon to begin in consequence of the unusually large grain crops this season. Since that time the season has so far advanced that there can be no doubt of the extraordinarily large production of wheat this year, very few quarters of the country where wheat is a leading product having less than a full crop, and most of them a larger area than heretofore planted and an unusually heavy crop per acre. The California crop, five sixths of which is for export, will be at least ten millions of bushels more than last year; the Northwestern crop, very large last year, is even larger this. The crop of corn is suffering now from drought in some of the chief exporting districts, and it is too early to be sure about that; but of wheat there is no doubt that the surplus for export is large without example.

We also called attention to the fact that an indirect consequence of the large production might be a renewal and embittering of the farmers' hostility to the railroad companies, and perseverance in the injurious legislation which otherwise, we think, would probably be abandoned or modified. The natural effect of legislation so unjust, so destructive when enforced, and so entirely unreasonable has been to lead the railroad companies to make efforts to explain the nature of their business, to give the facts concerning it, and some of the circumstances which govern the fixing of charges. This has had its effect—a tremendous effect, in fact, as any one who reads the newspapers of the Northwest knows. While all of them, we believe, continue to insist that the railroads shall do their work without unjust discrimination and for reasonable rates (and we hope they always will), and that ways and means shall be provided whereby it shall be made easy to compel them to do justice, almost all the newspapers of ability condemn, virtually at least, the attempts at regulation which have been made. They have at least made such progress as to learn that there are two sides to the question, that a railroad company has a right to earn a reasonable interest on the capital invested in it, if it can, and that to reduce by legal process the net earnings of a company which barely earns interest on its bonds is equivalent to robbing the proprietors of the railroad. But the newspapers are probably in advance of rural opinion in this matter. When the hostility to the railroads began and became bitter, almost without an exception they echoed it and, believing it popular (as it was), encouraged and cultivated it at a time when they actually knew nothing about the merits of the question.

That, having learned partly the falsehood of most of the charges and the injustice of the legislation proposed or passed, they should review their positions, call attention to the proven facts in the case and advocate moderation is certainly creditable to them, and will probably have a good effect in time; but it has not yet neutralized their efforts in the other direction, we fear, and a season of great overproduction and consequent unprofitable prices for grain may witness a more determined and disastrous effort to compel the railroads to work without pay.

Thus we do not look upon the enormous grain traffic which seems assured for next year as an unmixed good to the railroad companies. It might give them one of their most profitable years if prices were good; it is likely to give many of them a heavy traffic whether prices are high or low; but if prices are very low, they will be compelled by circumstances for which no one is to blame to carry at a small profit, and they may be attacked by hostile legislation, more or less effective, destructive to the companies and disastrous to the country.

We are, therefore, justified in inquiring as to the circumstances which will affect the price of grain during the coming year, chief of which is the probable foreign demand.

The New York Produce Exchange Weekly reports as follows the breadstuffs movement, including receipts, at the Ports of Chicago, Milwaukee, Toledo, Detroit, Cleveland, St. Louis and Duluth for the past four years each, ending with July:

	1873-4.	1872-3.	1871-2.	1870-1.
Flour, bbls.....	6,203,989	5,781,215	5,043,964	5,794,392
Wheat, bush.....	84,298,218	84,833,138	39,725,674	48,684,542
Corn, bush.....	65,028,352	62,428,249	69,585,701	47,375,912
Oats, bush.....	26,927,098	29,145,524	28,919,490	21,817,768
Barley, bush.....	5,017,898	9,129,913	6,385,563	5,357,182
Rye, bush.....	1,774,711	1,901,338	2,760,027	935,783
Total, bush.....	182,086,287	157,430,933	147,376,460	124,171,167
Flour to wheat.....	31,019,945	28,906,125	25,219,320	28,971,960
Grand total.....	214,003,232	186,337,078	172,595,780	153,143,127

Now we find that the total exports of the country for the 11 months ending with July were about 91,200,000 bushels (reducing flour to wheat), or at the rate of 100,000,000 bushels per year, so that the grain handled at these seven places in the West has been about two and one-seventh times the entire exports of the country for the time. The exports for the year past, however, have been 60 per cent. greater than for the previous year, more than 100 per cent. greater than for 1871-72, and 175 per cent. greater than for 1870-71. With an unexampled crop of wheat this season, and a good prospect for corn, while all the European wheat countries except England have excellent crops now harvested, and the prospect is fair for England, we have reason to inquire what we will do with our grain. Last year the English crop was light, and France, which generally produces its own supply, competed with it for the surplus of other countries—chiefly the United States and Russia. Now France will have a surplus, and Russia and Hungary have more than ever to export, while California has already harvested ten or twelve millions more than last year's immense crop, nearly every bushel of which must find consumers abroad. The outlook is exceedingly favorable for Europe, where the cost of bread is a large proportion of the yearly expenses of nineteen-twentieths of the population, and where, when bread is cheap, this enormous army of laborers, the great consumers of manufactured goods, has a largely increased sum to spend for clothing and other merchandise. A few years of cheap bread almost always produces a period of extraordinary prosperity in Europe in almost all classes of business. Here not only are most of the people producers of breadstuffs, and so interested in getting a high price for them, but to nearly every laborer the cost of his bread is a small proportion of his wages, and the lessening of this cost by one-half even does not largely increase the surplus which he can expend for other things. The average consumption of wheat is not more than six bushels per person; six bushels now costs about \$7.50 in New York, and if the price be reduced to 75 cents (when it would hardly pay to send it to market from the more distant wheat districts), he would have but three dollars more to spend per individual in his family. This to a man working for a dollar and a half a day and with a family of five is an increase of less than 4 per cent. in that part of his income which can be expended for other things than breadstuffs. The consumption of breadstuffs being quite as large for the poor as the rich, the saving for people with larger incomes will be the same sum and a smaller percentage of their income; so though the cheapness of breadstuffs will doubtless be an advantage to non-agriculturists, it may well be such that the losses to the agriculturists will much more than balance it, and the total income of the nation not needed for breadstuffs be smaller than usual.

But for this to be the case this year, prices must be very low indeed, for the increase in the crop will permit a considerable decrease in the price before reducing the gross income from the crop. A crop of 250,000,000 bushels at an average price of \$1.00 a bushel will return as much as 200,000,000 bushels at \$1.25 a bushel. But in the former case the producers most distant from market would yet suffer severely, for the price of transportation could not be

reduced in proportion to the decrease in the price of the product, and the producers in Iowa, Minnesota, Nebraska and Kansas would feel that the cost of transportation had made their crops comparatively valueless, which would really be the case, not because the price was excessive, but because the distance is so great that below a certain price grain cannot be produced profitably for export.

The California Pacific.

The Vice-President of this company, Mr. George E. Gray, has just issued a report for the year 1873, (the only report ever published by the company, we believe,) which seems intended to answer the questions concerning it which have been asked so frequently of late months, especially by its German bondholders, who with the rest of the world have tried in vain to learn where is the "California Pacific Extension Railroad," for and on the security of which \$3,500,000 was borrowed in 1869; for Mr. Gray goes back to the beginning and gives a history of the corporation which is likely to be handed down as one of the most disgraceful chapters in the history of American railroad corporations—which is saying a great deal.

Just before the publication of this report a Frankfurt paper brought us an account of a meeting of the holders of "California Pacific Extension" bonds, whose July coupons were not paid, at which some of the revelations of Mr. Gray's report were anticipated.

The California Pacific was one of the first railroads in California—perhaps the first. It first constructed between 1867 and the close of 1869 a railroad 60 miles long from the northern end of San Francisco Bay at Vallejo (24 miles from San Francisco) northeastward to Sacramento, with an extension or branch from Davisville, 13 miles west of Sacramento, northward up the west bank of the Sacramento River 44 miles to Marysville. The California Pacific Extension Company brought to it, apparently, what was known as the "Napa Valley Railroad," which extends from a junction with the California Pacific at a point seven miles north of Vallejo northward 35 miles to Calistoga—a line which is reported to have cost the Extension Company \$240,000 at a mortgage sale. There was thus 139 miles of the road. But in the floods of 1872, 25 miles of the road south of Marysville was carried away by the overflowed river and has not been rebuilt since, so the present length is 114 miles. The line from Vallejo to Sacramento has had a good traffic when in working order, giving a short route to San Francisco, and when the Central Pacific was completed the company had a fine fleet of steamers on the Sacramento River and did a thriving business. In 1873, Mr. Gray reports the receipts at \$7,919 per mile, the working expenses and taxes only \$4,098, so that the net earnings were \$3,821 per mile, which would pay 7 per cent. on an investment of \$54,600 per mile. But the funded debt is:

First-mortgage 7s.....	\$2,250,000
Second-mortgage 6s guaranteed by Central Pacific.....	1,600,000
California Pacific Extension 7s.....	3,500,000
Income 10s.....	1,000,000

Total (\$73,264 per mile)..... \$8,350,000

The yearly interest charge per mile from this debt is \$5,250 gold, and besides the company has a floating debt of about \$1,700,000, and in 1873 paid \$1,519 per mile for interest on this debt.

This makes it plain why the company cannot pay the interest on the Extension bonds; you cannot pay \$6,770 of interest with \$3,820 of net earnings, especially when instalments of the principal of loans are due yearly at the rate of more than \$2,000 per mile. So Mr. Gray has to report a deficit of \$1,104,672 in 1872 and \$731,509 last year.

But if we need no explanation of the fact that good earnings were not equal to such interest charges, we may be permitted to inquire how the company came to have so enormous a debt.

This Mr. Gray explains to us, and he first takes pains to let us know that it was not because of the costliness of the work. For he says that when the contractors, Messrs. Dewart C. Harkin, James M. Ryder and William F. Roelofson, were constructing the road, under an agreement to make it first-class, and Mr. Robert L. Harris, the company's engineer, notified the directors that the work was not properly done and a large part of the track was liable to be washed away (a part that has gone), the contractors were permitted to complete the road as they pleased, and "this communication appears to have terminated the connection of Mr. Harris with this company;" and when they had finished their work not only was the road accepted and the contract price paid, but the directors resolved that the contractors had done more than was required of them, and proceeded to give them \$1,300,000 more in the company's 12 per cent. notes, all the subsidies received from counties, and \$3,500,000 of its stock.

Nine months later, however, the company authorized the President to borrow \$2,500,000 "to secure the road-bed against winter storms."

In March, 1869, these contractors proposed to the company to organize the "California Pacific Extension Railroad Company," for the purpose of building branches of the road, and asked the California Pacific to guarantee its bonds, which its directors promptly promised to do, and did to the extent of \$3,500,000. "I have not been able to find," says Mr. Gray, "what disposition was made of these bonds or of their proceeds." The companies were consolidated Dec. 23, 1869, and the only asset that Mr. Gray can discover that was contributed by the Extension Company is the 35 miles of the Napa Valley Railroad which was bought at sheriff's sale for \$500,000 in its depreciated paper, worth about \$240,000, in return for which the California Pacific assumed the bonded debt of \$3,500,000 whose interest is now in default.

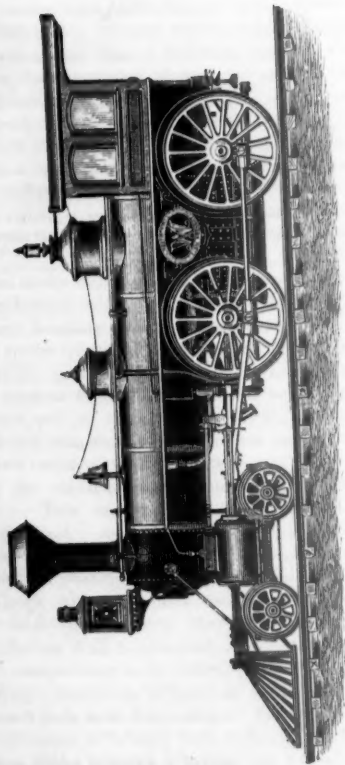
At the beginning of 1870 the same contractors entered into a contract with the company to supply steamers for the Vallejo & San Francisco ferry. They assigned this contract to the

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

[illegible]

CATECHISM OF THE LOCOMOTIVE.

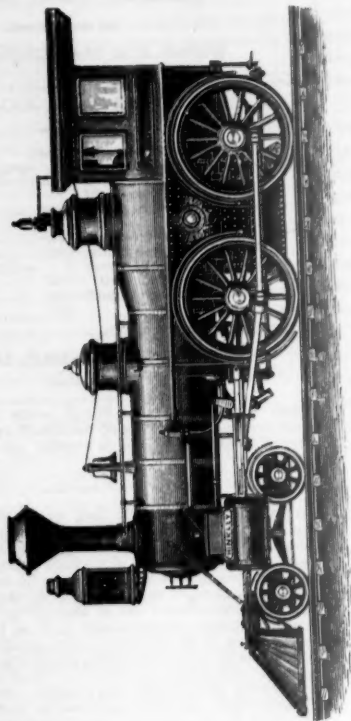
PLATE 9.



EIGHT-WHEELED "AMERICAN" LOCOMOTIVE,
BY THE MASON MACHINE WORKS, TAUNTON, MASS.

Scale, $\frac{1}{8}$ in. = 1 ft.

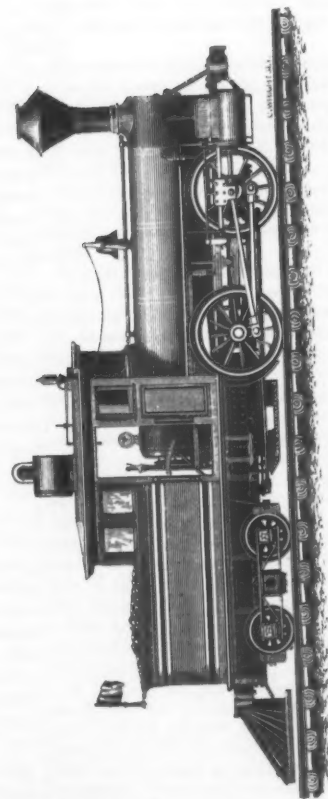
PLATE 10.



EIGHT-WHEELED "AMERICAN" LOCOMOTIVE,
BY THE HINKLEY LOCOMOTIVE WORKS, BOSTON, MASS.

Scale, $\frac{1}{8}$ in. = 1 ft.

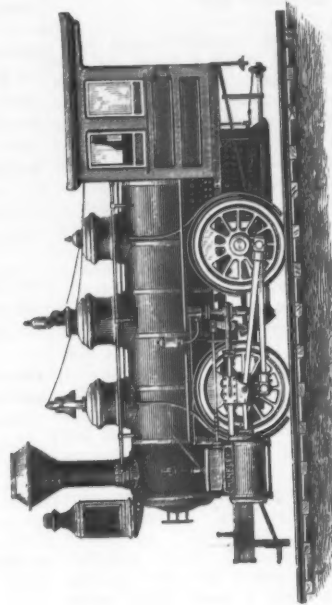
PLATE 11.



IMPROVED TANK LOCOMOTIVE,
DESIGNED BY M. N. FORNEY, 73 BROADWAY, NEW YORK.

Scale, $\frac{1}{8}$ in. = 1 ft.

PLATE 12.



FOUR-WHEELED SWITCHING LOCOMOTIVE,
BY THE HINKLEY LOCOMOTIVE WORKS, BOSTON, MASS.

Scale, $\frac{1}{8}$ in. = 1 ft.

California Pacific Steamboat Company, whose rights under its contract with its property the railroad company paid \$255,291 for in October of that year, receiving therefor four vessels valued at \$105,000.

In March, 1871, the directors resolved to issue \$300,000 of 10 per cent. income bonds, to obtain means for improvements of and additions to the property. The issue certainly was made, but Mr. Gray does not find "that the proceeds or any part thereof were used for carrying out the object for which it is said that the bonds were made."

In August, 1871, the issue of \$1,600,000 second-mortgage 6 per cent. bonds was ordered, "for the purpose of building additional track and to secure the present track against floods, etc." These bonds were turned over to Messrs. Leonard Stanford, C. P. Huntington and Mark Hopkins, the leading proprietors and managers of the Central Pacific, who undertook the contract for doing the work. These bonds were afterwards guaranteed by the Central Pacific. The road was soon afterwards largely destroyed by floods, and had to be rebuilt, and the performance of this necessary work was accepted, Mr. Gray says, in lieu of that called for by the original contract. This issue Mr. Gray seems to consider sufficiently accounted for.

It was about the time of this issue of second-mortgage bonds that the control of the road was given to the Central Pacific managers, the California Pacific Company just before that time having made a show of extending its competition by constructing a line to the Union Pacific. We do not find any information on this subject in Mr. Gray's report, but from the news published in our own columns at the time we ascertain the following facts:

On the 22d of May, 1871, a company called "California Pacific, Eastern Extension," was organized for the purpose of constructing a new line in connection with the California Pacific to unite the Union Pacific with San Francisco Bay, and of this corporation Milton S. Latham, J. Friedland, W. F. Roelofsen, Col. John B. Frisbie and Julius May of San Francisco and Rudolf Sulzbach, of Frankfurt on the Main were reported to be directors, Roelofsen being President, Col. J. P. Jackson, Vice-President, Latham Treasurer, and Col. W. H. L. Barnes Secretary. Thereafter its route was described as 943 miles long, from Davisville, near Sacramento to Ogden, passing through corners of Oregon and Idaho. Mr. George Alfred Townsend wrote from San Francisco to the *Chicago Tribune* that summer that Mr. Latham told him (referring to a current rumor) that the Pennsylvania Railroad Company "had no part nor interest in this extension; that it was all California and European capital, and that 100 miles of the road would be laid during the present year." In the following July we copied from a San Francisco paper a statement that the Central Pacific had bought the California Pacific and that the work of extending the latter had been suspended. (We have no information that it was ever begun.)

Closing his report with a statement of the receipts and expenditures of the company "since the change of ownership and management," which shows a loss of nearly \$1,500,000, besides most of the company's steamers (sold) and 25 miles of its road (washed away), the Vice-President says: "The responsibility for the acts that have resulted in covering your property with such a crushing load of debt you can correctly locate without any efforts of mine; my duty ends with placing before you the facts."

At the Frankfurt meeting there was present one General Frisbie, who was formerly President of the California Pacific Company, and seems to have preserved a hatred of Messrs. Stanford, Crocker, Hopkins & Co., such as might well have been produced in the days of the hottest competition between the California Pacific and the Central Pacific companies. General Frisbie said plainly that the California Pacific Extension had never existed; that of the proceeds of the Extension bonds \$800,000 had been expended for the branch from Napa to Calistoga (35 miles), and the rest expended on the old road, (which, Mr. Gray says, was not improved at all). As for the \$1,600,000 of second-mortgage bonds, General Frisbie said that a week before the controlling interest in the California Pacific bonds was delivered to the Central Pacific people, a contract was made for the construction of a second track. This, he says, never was executed, "but the proceeds of the \$1,600,000 second-mortgage bonds issued for this purpose were diverted fraudulently into the pockets of Messrs. Stanford, Huntington, Hopkins, etc."

It was reported at the meeting that Mr. Charles Crocker had offered on the part of the Central Pacific to pay 2 per cent. for 10 years, 3 per cent. for 10 years, and 4 per cent. for 10 years on the Extension bonds, and to guarantee 5 per cent. on the income bonds. General Frisbie was much opposed to such an agreement or to any agreement. He believed that the road could earn interest on all its bonds, and said that the whole proceeding was a sort of bluff game by the Central Pacific people to relieve themselves of part of their interest charges, and that if it was accepted they might expect to see defaults on the San Joaquin Valley and California & Oregon bonds. But afterwards General Frisbie was confronted with his own circular soliciting subscriptions for the Extension bonds, wherein it was stated that 42 miles of the extension was built, and that 100 more would be and form a security for the loan. He neglected to say how a road 114 miles long, nearly half of it branches, and with no railroad connections whatsoever (when disjoined from the Central Pacific) can be made to earn nearly \$600,000 gold interest. It looks very much as if the Extension bondholders had little prospect of getting their money, but there has evidently been a great fraud somewhere, and if they don't get their money somebody ought to go to the penitentiary.

Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

Green Pond.—Completed from Charlotteburg, N. J., southward 4 miles to Green Pond Mines. **Frankford & Breakwater.**—Completed by an extension from Millsboro southward 5½ miles to Frankford, Del. **Carolina Central.**—The Eastern Division has been extended from Wadeboro west 15 miles to Beaver Dam, N. C. **Baltimore, Pittsburgh & Chicago.**—Extended from Defiance, O., west 44 miles to a point 20 miles west of the east line of Indiana. **North Pacific Coast.**—Extended northward 5 miles to San Rafael, Cal.

This is a total of 73½ miles of new railroad, making 913 miles completed in the United States in 1874, against 1,966 miles reported for the same time in 1873, and 3,372 in 1872.

THE CHEAPEST RAIL FREIGHT RATE that we remember to have seen reported is that from Buffalo to New York on the 30th of July, when the *Buffalo Commercial Advertiser* says that 7½ cents per bushel was accepted for wheat. This is at the rate of a trifle less than 0.55 cent per ton per mile, while for the last year reported the average expense per ton per mile was 0.95 cent on the Central and 1.036 cents on the Erie. But this acceptance of a rate lower than the average would be less remarkable and might well be excusable if it had been on traffic taken to fill cars which would otherwise move empty. But it was on east-bound traffic, which is about three times as bulky as the west-bound, and we may reasonably presume that of every three cars which went east loaded with grain at this rate, two returned empty, and adding the mileage of empty cars, we have an average car haulage of 733 miles to earn \$24.17, or 3.3 cents per car per mile, which is a small fraction of the expense. This was an exceptional rate, of course, as it is more than a cent a bushel less than the canal rate, and is an example of the extraordinary things that will be done in competing for traffic. The railroad companies are always inclined to keep their rolling stock employed, which is very proper; but they should guard against accepting a rate in the prevailing direction of traffic less than the cost of doing the work, and compelling a further expense for hauling back the train empty.

LOW OCEAN FREIGHTS, just now, combine with unprofitably low interior freights to facilitate the movement of Western produce to the foreign market. For the first week of August the prevailing rate from New York to Liverpool by steam were 6¼ to 6½ pence per bushel for wheat, or about 14 to 15 cents of our currency. Add about 12 cents for the lake and canal rate from Chicago to New York and we have 27 cents as the charge for moving a bushel of grain a distance of about 4,500 miles. There are other expenses, of course, for transfer, but they are not strictly charges for transportation. Chicago No. 2 spring wheat was \$1.04½ in Chicago and \$1.23 in New York on the 10th, and a nearly equivalent grade in Liverpool was 10 shillings per hundred—about \$1.58 per bushel.

THE AMERICAN INSTITUTE will be ready for the reception of heavy machinery August 17 and for other articles August 31 for its forty-third exhibition, at the Exhibition Buildings, Third avenue and Sixty-third street, New York. The exhibition will be opened for visitors September 9. This, the oldest of all exhibitions of the kind in the country (we believe), always attracts great numbers of visitors during the six weeks it is open, and these visitors come from all parts of the country, as the exhibition is held just when the city is fullest of visitors. Manufacturers and inventors will doubtless find it to their advantage to bring their wares to the attention of the public on this occasion.

NEW PUBLICATIONS.

Gazetteer of Railway Stations.—This volume, compiled and published by the National Railway Publication Company, whose *Official Railway Guide* is one of the most complete works of the kind in the world, gives a mass of information which must be extremely valuable to all shippers. The greater part of its space is occupied by an alphabetical list of all the railroad stations in the United States and the Dominion of Canada, in which are given in the same line with the name of the station, which has signs to indicate whether that station has a postoffice or a money-order postoffice, the name of the county and State, the name of the railroad on which the station is situated, with signs to show whether there is an express office and a telegraph office there, and finally the population. This list covers 262 pages and includes the names of more than fourteen thousand stations, which gives one for every five miles of railroad, just about. As the publication of the *Official Guide* gives the compilers the completest information on the subject anywhere accessible, this is doubtless the completest list ever published.

There are several minor features of great interest in the volume, among them an alphabetical list of the railroad companies which work railroads in the United States and the Dominion, with the gauge of each road and the name of the express company which does business on it. Another and an extremely valuable feature is the "List of Old and New Names of Roads," under which old names of roads whose titles have been changed or which are now worked by a company with a different name are given alphabetically, followed in the same line by the name under which it now goes and to which its stations are credited. Even those most familiar with our railroad system must often be puzzled by the frequent changes in names, while locally often a road is known by a name which was changed many years ago, and of which no record can be found in guides or manuals. For instance to this day at Jacksonville, Ill., you will find people speaking of the Toledo, Wabash & Western as the "Great Western Railroad," while at Lafayette, Ind., it is commonly known as the "Wabash Valley." If this list should be made complete, and include all the names by which any road or part of road has ever been known, it would be of very great value, and have a historical importance.

Another very interesting feature is a list of the different routes (railroad, steamboat and stage) which every express company does business on.

Next to the list of stations in extent is a "List of the Principal Points, Counties and States in Territory Occupied by Wells, Fargo & Co.," showing the nearest express office to each point, and preceded by a list of this company's express offices not on railroads. As this company occupies chiefly the Territories and the Pacific Coast, whose geography is least known and where railroads are fewest, there is a special reason for the publication of this list, which is the one prepared for the company for its own use. There is also a list of counties, county towns, and times of holding courts in the several States, which will be useful to many; tables of the towns, their distance from the head of navigation (or other point), and population on the Ohio, Tennessee, Missouri, Ouachita, Cumberland, Mississippi, St. Croix, James, Illinois, Yazoo, Red and Green rivers—information for which we have often looked in vain, and which we would wish to see extended so as to include all the navigable waters of the country. There are also some tables of values of coins, postages, populations, etc.

The volume contains 440 pages of the size of *Appleton's* and *Rand & McNally's* guides, and just half as large as the *Official Guide*, and the price is a dollar in paper or a dollar and a half bound. As in the nature of things the work will require frequent revision, it is intended to publish new editions as they may become necessary, and the demand for it, we should say, will make frequent or very large editions necessary.

Train Accidents in July.

On the 1st, as a train on the St. Louis & Southeastern road was passing over a trestle bridge near Springfield, Tenn., one truck of the tender jumped the track and ran some distance on the ties before the train could be stopped.

On the afternoon of the 1st, a train on the New York & Oswego Midland was thrown from the track at North Bay, N. Y., the engine and several cars being wrecked and the track blocked a whole day. The accident was caused by a misplaced switch.

On the morning of the 2d, an excursion train on the Missouri River, Fort Scott & Gulf road ran into the rear of a freight train which was standing on the track near Kansas City, Mo. The engine and several cars were wrecked, and the engineman, fireman and another man, who was on the engine, were injured in jumping.

On the 2d, two cars loaded with whisky in an east-bound freight train on the Indianapolis, Bloomington & Western road caught fire when the train was near Ogden, Ill., and were destroyed before it could be stopped.

About noon on the 3d, there was a butting collision between a coal train and a switching engine of the Baltimore & Ohio road on a curve near Fort avenue in Baltimore, by which both engines were badly damaged.

On the morning of the 4th, there was a butting collision between a passenger and a mixed train at Silver Lake, Ind., on the Cincinnati, Wabash & Michigan road, by which both engines and several cars were wrecked and two men injured. The accident was caused by a misapprehension of orders.

On the 4th, a passenger train on the Vicksburg & Meridian road ran off the track near Edwards, Miss., several cars going down the bank, killing two children and injuring three passengers.

On the 4th, during a very violent storm, the bridge over the Susquehanna at Lewistown, Pa., on the Lewistown Division of the Pennsylvania Railroad, was blown down, carrying with it 28 freight cars which were on it at the time. Three persons were killed and four injured.

On the afternoon of the 4th, a train of empty cars on the Lewistown Division of the Pennsylvania Railroad was thrown from the track near Lewistown, Pa., by a heavy gale of wind.

On the night of the 4th, an emigrant train on the New York Central & Hudson River was thrown from the track at Coxsack, N. Y., where a landslide had covered the track.

On the afternoon of the 5th, three cars of a passenger train on the Hudson & Chatham Branch of the Boston & Albany road were thrown from the track near Melville, N. Y., injuring three men.

On the morning of the 6th as a passenger train of seven cars was running out of a siding on to the long trestle bridge at Stony Creek, Conn., on the Shore Line Division of the New York, New Haven & Hartford road, the rear truck of the last car jumped the track and that car upset and rolled over into the salt marsh, dragging after it all the cars of the train. Division Superintendent Wilcox, who was in the baggage car, was crushed to death under that car, 12 passengers were severely injured and a large number received slight bruises. It is said that the station agent, who was tending the switch, threw it over before the last train had passed over it, thus causing the derailment. He was discharged but denies the statement.

On the morning of the 6th a freight train on the Fort Wayne, Jackson & Saginaw Railroad ran over a cow near Hillsdale, Mich., throwing six loaded cars from the track, wrecking them and blocking the road five hours.

On the morning of the 6th, in Jersey City, N. J., a coal train on the Erie Railway ran into a passenger train, wrecking a car and blocking the track two hours.

On the morning of the 6th as a locomotive on the Morris & Essex Division of the Delaware, Lackawanna & Western road was running out of the Hoboken yard it jumped the track at a frog, running down between the tracks and blocking them both for some time.

On the 6th, a construction train on the Rhinebeck & Connecticut Railroad ran off the track near Gallatinville, N. Y., injuring the Superintendent, who was on board.

On the afternoon of the 8th, on the Memphis & Little Rock Railroad, near Brinkley, Ark., nine cars of a freight train went through a trestle bridge and were badly wrecked.

Very early on the morning of the 9th, the east-bound express freight on the New Jersey Midland broke in two on a grade near Deckertown, N. J., and when the forward portion of the train was slowed up the rear portion ran into it with such force as to break a draw-head, which fell on the track and threw off several cars. The cars were badly wrecked and the road blocked for nearly a day.

On the afternoon of the 10th the mail car on an east-bound train on the Atlantic, Mississippi & Ohio took fire when near Petersburg, Va., and was almost entirely destroyed before the train could be stopped.

On the night of the 10th an east-bound express train on the New York Central & Hudson River ran off the track at Palatine Bridge, N. Y., and was delayed an hour and a half. The accident was caused by a defective joint.

On the morning of the 11th several cars of a freight train on the New York Central & Hudson River were thrown from the track and wrecked at Fort Plain, N. Y.

Near midnight on the 11th, as a west-bound freight train was hauling out of the Utica yard of the New York Central & Hudson River road, an engine coming up a side track to the main line struck the train near the center, pushing several cars from the track and over upon the east-bound track.

A minute afterwards an east-bound freight which was just entering the yard ran into these cars, injuring the engine and demolishing eight cars.

On the morning of the 13th, an east-bound express on the

Baltimore & Ohio ran into a land-slide at the Seven Curves, 10 miles east of Cumberland, Md. The engine and tender were upset and the baggage and postal cars thrown across the track and badly damaged.

On the 13th, there was a collision between freight trains on the New Jersey Midland Railroad, at West End, N. J., by which two cars were damaged.

On the evening of the 13th, the pay train of the Fitchburg Railroad, consisting of an engine and one car, was thrown from the track on a bridge over a highway near Shelburne Falls, Mass., on the Vermont & Massachusetts Division. The train went down 15 feet, wrecking both engine and car, damaging the bridge and injuring five persons. The accident is said to have been caused by a broken flange.

On the morning of the 14th, there was a collision between two freight trains on the Marietta & Cincinnati road, near Athens, O., by which an engine and several cars were wrecked, the road blocked several hours and a fireman killed.

On the 14th, on the Geneva, Ithaca & Athens road, near Geneva, N. Y., 14 cars of a coal train were thrown from the track by a defective joint, and a brakeman badly injured.

On the night of the 14th, there was a collision between two trains on the Brooklyn, Bath & Coney Island road, near Locust Grove, N. Y., by which two cars were wrecked.

Early on the morning of the 15th, a lumber train on the Atlantic & Richmond Air Line went through a trestle bridge over New Creek, near Atlanta, Ga., wrecking the train and bridge, killing one man and injuring six others.

On the night of the 15th, the engine and baggage car of a train on the Cincinnati, Richmond & Fort Wayne road were thrown from the track by a misplaced switch at Perry's, Ind. The switch had been broken and purposely misplaced, leaving the lever an 1 target in the right position.

On the morning of the 15th, a train on the Morris & Essex Division of the Delaware, Lackawanna & Western road ran off the track at the east end of the Bergen Tunnel, blocking both that road and the Erie for some time.

About 9 o'clock on the morning of the 18th there was a butting collision between two express trains on the Erie Railway, near Canaseraga, N. Y. Both engines were badly wrecked and the baggage and smoking cars of the west-bound train were destroyed, the first passenger coach having passed completely over the smoking car, leaving nothing of it but the floor. The baggage car of the east-bound train was wrecked, but the other cars of both trains escaped serious damage. The collision took place on a sharp curve and was said to be the fault of the engineer of the west-bound train, which should have waited for the other at Burns', but for some reason did not stop there at all. A baggage man was killed and nine persons seriously injured.

On the 18th, several cars of a freight train on the Petersburg Railroad were thrown from the track near Beam's, Va., blocking the road several hours.

On the 18th, there was a butting collision on the Jackson, Lansing & Saginaw road near Jackson, Mich., between a freight train and a new engine which was out on a trial trip. The new engine was badly wrecked. The accident is said to have been caused by gross carelessness.

On the 18th, on the Charlotte Branch of the New York Central & Hudson River, a locomotive and 18 coal cars were thrown from the track by running into a hand car loaded with rails. The locomotive upset and blocked the track several hours.

On the 18th, as a gravel train on the Detroit, Lansing & Lake Michigan road was running backward near Trufant, Mich., a burning tree fell across the track, throwing off nearly the whole train, killing 7 men and wounding 16.

Early on the morning of the 19th, a dummy train on the North Columbus (Ohio) Railroad ran into a horse which was stuck fast in a trestle bridge, throwing a car down 35 feet and injuring 10 persons.

On the night of the 20th, nine cars of a freight train on the Boston, Hartford & Erie Railroad were thrown from the track and wrecked near Mill River, Mass., by a broken axle. Two brakemen were injured.

Early on the morning of the 21st, a west-bound express on the Baltimore & Ohio was thrown from the track at Bridgeport, W. Va., by a defective switch, the postal, baggage and two passenger cars going down a bank. Three persons were injured.

On the 21st a west-bound freight train on the Southern Minnesota Railroad ran into the rear of a gravel train which was standing on the track loading up near Isinour's, Minn., damaging a locomotive and several cars. The freight train ought to have stopped for orders at the preceding station.

On the morning of the 22d, on the Baltimore & Ohio Railroad, a west-bound freight train stopped at Shepherd's Tunnel to cool a hot box, and was shortly after run into by a following extra, wrecking the engine and several cars, and injuring the engineer. A brakeman had been sent back to flag the extra, but did not go far enough.

On the evening of the 22d a west-bound train on the California Pacific road was thrown from the track by a misplaced switch at Davisville, Cal., and delayed two hours.

On the night of the 22d a north-bound passenger train on the Evansville, Terre Haute & Chicago road was thrown from the track at Hoff's mine, near Clinton, Ind., by a misplaced switch, ditching the engine and several cars, and injuring the engineer, fireman and a brakeman.

On the 23d a west-bound freight train on the New Jersey Midland ran into the rear of a gravel train near Hamburg, N. J., wrecking several dump cars.

About 3 o'clock on the afternoon of the 23d there was a butting collision between a passenger train and a wild engine on the Long Island road near Woodside, N. Y., by which both engines were wrecked and the road blocked several hours.

On the 26th a mail train on the Missouri, Kansas & Texas road ran into some cattle on the track near Caddo, in the Indian Territory, and the engine and several cars were wrecked.

On the 26th a south-bound freight train on the Louisville, Cincinnati & Lexington went through a bridge at Sparta, Ky., which had been damaged by a violent storm.

On the night of the 26th, on the Louisville, Cincinnati & Lexington road, the engine and two cars of a passenger train went through a bridge the abutments of which had been washed out by a terrible storm. Four men were injured.

On the night of the 26th five cars of a freight train on the Louisville, Cincinnati & Lexington road were thrown from the track near Eagle, Ky., at a place where the road-bed had been washed out by a sudden and severe storm, this being the third accident on the road caused by the same storm.

On the evening of the 27th a south-bound freight train on the Missouri, Kansas & Texas was thrown from the track on a trestle near the Red River bridge, ten cars going off and falling from the trestle to the ground. The accident is said to have been caused by the expansion of the rails from the heat, throwing one out of line. A brakeman was injured.

On the 28th a construction train on the Boston, Hartford & Erie road ran off the track in South Boston, Mass., blocking the road two hours.

On the 28th on the New Orleans, Mobile & Texas road, near Mobile, Ala., a train was thrown from the track by a misplaced switch, killing the engineer and fireman.

On the night of the 28th there was a butting collision between a passenger and a freight train on the Grand Trunk Railway near Solvante, Quebec, by which both engines and several cars were wrecked, and four persons injured.

On the morning of the 29th there was a butting collision between two passenger trains on the Flushing, North Side & Central road at Island Tree Station, N. Y., by which both engines were damaged. The trains were to pass at that point

and one was going on the siding, but the brakes on the other train did not hold.

On the 29th as a construction train was standing on the track of the Chicago, Burlington & Quincy road in Aurora, Ill., it was run into by a freight train, wrecking several cars.

About 3 o'clock on the afternoon of the 29th on the Grand Trunk Railway at Fort Erie, Ont., there was a collision between a freight and a gravel train, both of which were backing at the time. A caboose was wrecked, two persons killed and three injured.

On the morning of the 30th, at Riverside, Ill., on the Chicago, Burlington & Quincy Railroad, a west-bound train which had gone on to a siding to permit a passenger train to pass, was started out just as a freight train was going by eastward, and got so far in its way that one car was wrecked and a stick of timber was driven through the steam chest. The engineer and a brakeman of the north-bound train were decided to be at fault and were discharged.

On the 30th, a wild engine on the New York Central & Hudson River was thrown from the track at Yost's Station, N. Y., by a defective joint.

On the 30th the locomotive of a freight train on the New York Central & Hudson River was thrown from the track near Fonda, N. Y., and badly wrecked.

On the night of the 30th, several cars of a freight train on the Chesapeake & Ohio Railroad broke loose from the train near Goshen, Va., and were run into a few minutes afterward by an extra which was following. Several cars were wrecked.

About 7 o'clock on the morning of the 31st, a west-bound passenger train on the Hannibal & St. Joseph road was thrown from the track by a loose switch at Cameron, Mo., the baggage and one passenger car running off and upsetting, blocking the road three hours. The switch-tender had set the switch right but failed to put in the pin, and the engine, which passed over safely, jarred the switch rail from its place.

On the morning of the 31st, a west-bound freight train on the Western North Carolina Railroad ran off the track in a rock-cutting near Icard, N. C., injuring a brakeman. The accident was caused by a broken wheel.

On the 31st, a car of an express train on the Albany & Susquehanna road was thrown from the track and upset near Cobleskill, on the Chert Valley Branch, injuring seven persons. The accident was caused by a low joint.

This is a total of 64 accidents, whereby 20 persons were killed and 104 suffered serious injury. Nine accidents caused the death of one or more persons, sixteen others injury but not death, and 39 accidents, or 61 per cent. of the whole number, caused no serious injury to any person.

These accidents may be classified as to their nature and causes as follows:

COLLISIONS—		
Rear collisions.....	7	
Butting collisions.....	8	
Crossing collisions.....	2	
Unexplained.....	4	21

DERAILMENTS—		
Unexplained.....	10	
Misplaced switch.....	6	
Broken bridge.....	5	
Defective rail-joint.....	4	
Cattle on track.....	3	
Land-slide.....	2	
Broken flange or wheel.....	2	
Broken drawhead.....	1	
Broken axle.....	1	
Defective switch.....	1	
Loose switch.....	1	
Spreading of rails.....	1	
Hand-car on track.....	1	
Fallen tree.....	1	
Washout.....	1	
Wind.....	1	

Cars burned while running..... 41

Total..... 64

The number of collisions, and especially of butting collisions, is unusually small in proportion to the whole number of accidents. The list is unusually short, only one month during last year having shown a smaller number. The killed and wounded, however, are unusually numerous in proportion to the accidents. Eight of the derailments are traceable directly to carelessness of switchmen or signalmen, besides several of the collisions. Of the five broken bridges all were wooden bridges and three of the failures were caused directly by storms, in one instance the bridge being forced bodily from the abutments by wind, and in three others the abutments being washed out. Fifteen accidents were caused directly by defects or failures of road or equipment.

For the year ending with July the record is as follows:

	No. of accidents.	Killed.	Injured.
August.....	150	63	155
September.....	106	29	75
October.....	88	11	47
November.....	76	11	50
December.....	80	16	43
January.....	108	18	98
February.....	90	25	49
March.....	88	18	49
April.....	39	3	19
May.....	89	19	51
June.....	83	22	55
July.....	64	20	104
Totals.....	1,081	250	788

The average per day for July is 2.06 accidents, 0.65 killed and 3.35 injured; for the year it is 2.96 accidents, 0.68 killed and 2.16 injured. While the daily average of accidents for July is much below that of the year, the average number killed is nearly the same, and the average injured is over one-half greater.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—The annual meeting of the Springfield, Athol & North-eastern Railroad Company was held in Athol, Mass., August 4, and the following directors re-elected: William Birnie, Homer Foot, Charles R. Ladd, Willis Phelps, Springfield, Mass.; Thomas H. Goodspeed, John C. Hill, Athol, Mass.; Edward Smith, Rufus D. Woods, Enfield, Mass.; J. W. Goodman, Dana, Mass.; Stephen P. Bailey, Greenwich, Mass.; Samuel Adams, New Salem, Mass. The board subsequently elected Willis Phelps, President; Rufus D. Woods, Vice-President; Thomas H. Goodspeed, Clerk and Treasurer.

—The annual meeting of the Cleveland & Mahoning Valley Railroad Company was held in Cleveland, O., August 5, and the old board of directors re-elected, as follows: Henry E. Parsons, Ashtabula, O.; Reuben Hitchcock, Painesville, O.; J. H. Devereux, John Tod, Stevenson Burke, A. K. Spencer, Charles Pease, Cleveland, O.; S. L. M. Barlow, W. P. Ewing, New York. The board subsequently met and elected Henry

E. Parsons, President; J. H. Devereux, Vice-President; Charles Pease, Secretary, and A. K. Spencer, Treasurer. The road is leased to the Atlantic & Great Western.

—Mr. George M. Huntington having resigned his position as General Passenger and Ticket Agent of the West Wisconsin Railroad, Mr. Frank B. Clarke, heretofore General Freight Agent, will assume the immediate charge of the Passenger Department with the title of General Freight and Passenger Agent, with office at St. Paul, Minn. Mr. G. K. Barnes has been appointed General Ticket Agent, with office at St. Paul, and will have immediate charge of all tickets, rates, etc., issued by the company. He will also discharge the duties of General Baggage Agent until other notice is given.

—The following appointments have been made in the Auditor's office of the Erie Railway: A. Jaffrey, Auditor of Freight Receipts; O. W. Cook, Auditor of Passenger Receipts; D. F. Hervey, Auditor of Disbursements.

—Mr. Brandon Mozley has been appointed Superintendent of all the Canada Southern lines west of the Detroit River, including the Toledo, Canada Southern & Detroit, the Chicago & Canada Southern and the Canada Southern Bridge Company's road. He replaces Mr. D. Edwards, resigned. Mr. Mozley was at one time Superintendent of the Sheboygan & Fond du Lac road.

—Mr. R. G. Fleming, of Columbia, S. C., has been appointed Superintendent of the Port Royal Railroad.

—Mr. J. G. Hopper has been appointed Superintendent of the Joliet Division of the Michigan Central Railroad, in place of Carlton Wheeler, resigned.

—The board of directors of the Flint & Pere Marquette Railroad Company met in East Saginaw, Mich., recently and re-elected the old officers as follows: E. B. Ward, President; Samuel Farwell, Vice-President; H. C. Power, Secretary and Treasurer. The following appointments, heretofore announced as in force since Jan. 1, 1874, were confirmed: H. C. Potter, General Manager; Sandford Keeler, Assistant Superintendent; J. P. Nourse, General Ticket Agent; G. W. Ledlie, Auditor.

—Mr. William E. Welch, formerly a resident engineer on the Northern Pacific Railroad, has been appointed Chief Engineer of the Chester & Delaware River Railroad.

—Col. F. P. Harrison, of Andersonville, S. C., has been chosen President of the Augusta & Hartwell Railroad Company.

—At the annual meeting of the Atlanta & West Point Railroad Company in Atlanta, Ga., July 25, the following directors were chosen: E. C. Yancey, J. Bigby, Atlanta, Ga.; W. B. Berry, Newnan, Ga.; John F. Moreland, La. Grange, Ga.; L. B. Lovelace, West Point, Ga.; Ferdinand Phinizy, Athens, Ga.; John P. King, Augusta, Ga. The only new director is Mr. Bigby, who replaces John E. Robinson. The board subsequently elected John P. King, President; William P. Orme, Secretary and Treasurer; L. F. Grant, Superintendent.

—Major Josiah Hunt, of Hannibal, Mo., has been appointed Receiver and General Manager of the Mississippi Valley & Western Railroad.

PERSONAL.

—Mr. Julius Webb has resigned his position as General Manager of the Norwich & New York Transportation Company.

—Mr. T. W. Spencer, who recently resigned his position as General Superintendent of the Utica & Black River Railroad, is not a contractor for the extension of that road, as was stated last week. The work on the extension is being done by the company directly, and Mr. Spencer has charge of it as Chief Engineer. He resigned the Superintendent's position in order to give his whole time to the new work.

—Col. Charles B. Lamborn, who recently resigned his position as Secretary of the Kansas Pacific Railway Company, did so in order to assume charge of the Central Colorado Improvement Company, a corporation which owns valuable landed interests in the Arkansas Valley, including the town site of South Pueblo and some 80,000 acres of adjoining lands, as well as the Canon coal mines, which now furnish Denver with nearly half the coal consumed in that city.

—Mr. R. P. Morgan, Sr., one of the oldest civil engineers in the country, and a frequent contributor to the RAILROAD GAZETTE, celebrated his 84th birthday anniversary at Dwight, Ill., last week. He has been prominently connected with the early history of many important works and lines of railroad in this country. Mr. Morgan still enjoys good health, and hopes to live long enough to introduce certain reforms in the construction of railroad equipment which, he believes, will much reduce the expense of operating a road.

THE SCRAP HEAP.

Trial of a Hydraulic Brake.

A trial of the Henderson patent hydraulic brake was made on the West Chester & Philadelphia Railroad, July 21, and is thus reported by the Philadelphia Ledger:

"The train consisted of five passenger cars and one baggage car, attached to a large and powerful locomotive. It left the depot at 11 o'clock, and ran about ten miles up the road, during which several stops were made and the workings of the brake thoroughly tested. The first stop was made on a grade with a descent of 15 feet to the mile, running at a speed of 35 miles per hour, when the train was stopped in a distance of 630 feet and in 20½ seconds time, with a boiler pressure of 105 pounds to the square inch. The second was made on a grade of about the same inclination, at a speed of 33 miles, and in a distance of 540 feet, at a boiler pressure of 115 pounds to the square inch. The third stop was on a level, at a speed of 35 miles an hour, and was made in 840 feet, in 28½ seconds time, with a boiler pressure of 105 pounds to the square inch. This stop was made by bell signal from the rear end of the train.

"The brake is under the control of and is worked by the engineer of the locomotive. The following description will give an idea of the manner of its operation. Between the wheels of each truck there is placed a cylindrical vessel of cast iron, whose ends are formed of two dish-shaped flexible diaphragms of India rubber, secured by flanges bolting thereto. Two rams working in opposite directions are fitted against and into the hollow part of the diaphragms, their outer ends are attached by rectangular flanges and bolts to the brake-beams carrying the brake-shoes. The several castings are simply bolted together, with the diaphragms, as they come from the foundry, without recourse to the usually expensive mechanical fitting.

"When pressure comes between the diaphragms, it simply forces them apart, projecting the rams, which act immediately on the brake-beams, applying the brakes; and when the pressure is relieved the atmosphere reacts on the area of the rams and forces them back, assisted by the tendency of the diaphragms themselves to recover their normal condition."

Pay of Station Hands in England.

The London Railway Service Gazette calls attention to the bad treatment to which the servants of the London, Chatham & Dover Company are subjected. "At the principal goods station in London the major part of the men receive only eighteen shillings per week of seven days, and have to work twelve hours per day. Two years ago they sent in a memorial

paying for an advance of wages. This was met by some slight concessions, which, however, are now almost entirely nullified by the adoption of a very unfair course of action on the part of the directors. When a man becomes entitled to his increase of one shilling per week and applies for it, the extra money is almost invariably refused on the ground that he has broken some rule of the company, however unimportant, and consequently that he has forfeited his right to an advance of wages." Eighteen shillings at the present price of gold is equal to \$4.80 of our currency, which makes the pay something less than six cents an hour.

"Knocking Down" in Peru.

Not all the dishonesty, it seems, is on our North American railroads. At a recent meeting of the Lima Railways Company in London the chairman said:

"Colonel Grey, one of the directors who had recently visited the railroad, found that a large proportion of the passengers used the line without taking any ticket; that collectors were consequently appointed to travel on the line and apply for and endeavor to get fares from the passengers who admitted they had no tickets. They might judge the extent to which this system had been carried by the fact that as much as from \$20,000 to \$30,000 per annum had been paid in by those collectors. They had reason to believe that a large proportion of the passengers had paid nothing at all. He would leave them to judge whether the company got anything like the full amount of its actual earnings. The temptation to the collectors was excessive. He had also found that as many as 15,000 free passes had been granted in the year, and that these passes were used continuously and not by any means confined to a single journey."

The "pass system seems to have been developed in its highest state on this road, as it accepted such granted by government officers as well as the railroad officials. The line is the one from Lima to the sea at Callao, which pays 10 per cent. dividends and has so much traffic that the company is preparing to lay a second track.

OLD AND NEW ROADS.

The Saratoga Agreement.

A dispatch from Indianapolis gives the substance of the resolutions adopted at the recent meeting of railroad managers at Saratoga. They are as follows:

First. Any Western road may keep an agent in any Eastern city, provided that such agent shall not be a billing or contracting agent, and shall be under the supervision of the trunk Line Commissioners in respect to the maintenance of rates.

Second. Rates on freights between common competitive points, east bound, are to be established by the Commissioners, and the rates both ways shall be divided between the lines carrying the trade on such basis as they may agree upon.

Third. Questions arising out of rates for freight by rail and on the lakes are to be determined by the Eastern and Western Commissioners jointly, the plan to be agreed upon by a majority of each Commission, recognizing obligations under existing contracts between trunk lines and their organized steamboat connections on the lakes, but giving the best practicable protection to all rail lines.

Fourth. Commissioners at the several Western railroad centers are to be nominated by the respective competing lines, but to be approved by all parties to the agreement. The Commissioners will be located in Cleveland, Cincinnati, Indianapolis, Louisville, St. Louis, Chicago, Detroit, and at such other points as the Western lines may hereafter choose.

An agreement, it is said, is being drawn up to be signed by all the Western roads in the interest of specific matters passed upon above, the present contract between the New York Central and Pennsylvania Railroads will form the basis of agreement. The several fast freight, dispatch and colored lines, were directed to stop buying or presenting paid tickets to any of their patrons.

There are to be two Bureaus of Commissioners—an Eastern and a Western Bureau. The Commissioners are to be located in the respective cities named. The Eastern Bureau, representing the trunk lines, is composed of Hon. Wm. Denison, Columbus; Hon. T. S. Jewett, Philadelphia, and B. W. Blanchard, New York. The following Commissioners form the Western Bureau: L. M. Hubby, Cleveland; General George B. Wright, Columbus; Warren Colburn, Toledo; M. Drummond, Chicago; L. N. Andrews, Indianapolis; Samuel Gill, Louisville, and J. H. Sturgeon, St. Louis.

Emigrant Rates Westward.

The contest over the emigrant business which has been going on since March last has come to an end by the mutual agreement of the parties concerned, the Pennsylvania, New York Central and Erie companies. It has been resolved to go back to the old rates which were in force before the trouble commenced. The increase in rate, the fare from New York to Chicago being increased from \$5 to \$13, and to St. Louis from \$7.55 to \$15.55, and other points in proportion. This is, doubtless, one of the results of the conference at Saratoga.

Railway.

Work on the grading is in progress, and arrangements have, it is said, been made for the rails. The road will be three miles long, from Rahway, N. J., northeast to Morse's Mill, where it will connect with the New Jersey Central's Long Branch line.

A New International Bridge.

In addition to the Canadian charter, a charter was obtained last winter from the New York Legislature for a company to be known as the Niagara River Transit Company, whose object is to cross the Niagara River at Grand Island either by a bridge or tunnel. A meeting to organize this company was to be held in Buffalo, August 12.

Flint & Pere Marquette.

During July \$48,000 of land-grant bonds were cancelled from the proceeds of land sales, making in all \$126,000 canceled this year. Out of \$980,000 of the first and second series of bonds only \$92,000 are now outstanding and these will probably be canceled during the year.

Mississippi Valley & Western.

Interest on the last coupon due on the bonds being unpaid, the road, under the terms of the mortgage, has passed into the hands of the trustees. A meeting was held in Keokuk, Ia., August 4, at which the trustees, the directors and a number of creditors were present. The firm of Stone & Co. (Amasa B. Stone, of Cleveland, O., and John Fallon, of Philadelphia) made a proposition to bid \$875,000 for the road whenever it should be put up for sale under the first mortgage, which would be in about 90 days, under the terms of the trust; that Stone & Co. would immediately commence work and complete the line from Hannibal to Louisiana this fall, so as to secure a St. Louis connection over the Chicago & Alton, and also that they should have the right to organize a new company and change the name of the road to the St. Louis, Keokuk & St. Paul Railroad. This proposition was accepted by the trustees, with the understanding also that if other parties appeared on the day of sale and bid more than \$875,000 the road would go to the highest bidder, but that the work done by Stone & Co. pending the sale should be a first lien on the purchase money. Maj. Josiah Hunt has been appointed Receiver and will manage the road until the sale.

There are 52 miles of the road in operation, from Keokuk, Ia., southward to Hannibal, Mo. The company has been in embarrassed circumstances some time and has a heavy floating debt. The extension to Louisiana will be about 25 miles long, down the west bank of the Mississippi.

St. Joseph & St. Louis.

Certificates of stock in this new company, formed by the bondholders of the St. Louis & St. Joseph, are nearly ready to be delivered. Ten shares of \$100 each are issued in exchange for each \$1,000 bond. The holders of all but 86 bonds out of 1,000 joined in the foreclosure proceedings and the formation of the new company. The holders of those 86 received \$83 46 for each \$1,000 bond as their share of the purchase money. The purchasing committee reports that the receipts from assessments were \$31,575, its expenditures \$27,461 55, leaving a balance of 4,113 45.

The lease to the St. Louis, Kansas City & Northern is for 99 years. The lessee agrees to put and keep the road in good order, pay taxes for 1874 and all subsequent years, pay for two years \$10,000 per annum, then for three years \$35,000, and thereafter 30 per cent. of the gross earnings.

Carolina Central.

The track on the Eastern Division is laid to Beaver Dam, N. C., 15 miles west of the late terminus at Wadsworth and about 10 miles east of Monroe. About 35 more will complete the Eastern Division to Charlotte.

It is now proposed to build the Western Division only to Shelby and then build a branch from Lincolnton northward to the Western North Carolina road, which is there about 20 miles distant.

Washington & Ohio.

Grading is progressing steadily on the extension from Purcellville, Va., to Round Hill.

Southern Pacific.

As soon as the San Joaquin Valley line is completed to Bakersfield, part of the construction force will be set at work on an extension of the branch line which runs southward from Los Angeles from its present terminus at Gallatin to Anaheim.

Woodstock.

The stockholders met in Woodstock, Vt., Aug. 8, and authorized the directors to contract for the completion of the road. The work was subsequently let to S. S. Thompson for \$200,000.

A Meeting of Railroad Managers.

A private meeting, which was an adjourned meeting from the conference at Saratoga, was held in New York August 11. The Pennsylvania, Erie, New York Central, Boston & Albany, Great Western and other companies were represented, and it was understood that the regulation of freight rates was the subject of discussion. Another meeting is to be held to consider the affairs of the passenger department.

Wilmington & Weldon.

Over 80 miles of new rails have been laid this year. The road is being thoroughly repaired and placed in good condition.

South Side, of Long Island.

In addition to the foreclosure sale ordered by the State Court to take place August 31, the United States District Court has ordered a sale in bankruptcy to be made August 22. The latter sale is, however, to be made subject to all the mortgage liens on the road. It is understood that there are three parties endeavoring to obtain possession of the road, represented respectively by Oliver Chelrick (President of the Long Island Company), the present Receiver, (Mr. Cornell,) and Mr. Fox, the old President, and the various cross proceedings are supposed to be instigated by the opposing interests.

New York Central & Hudson River.

The Albany Journal says: "Work is still progressing on the break in the Athens Branch, near Coxsackie, caused by the sinking of the track, four weeks having expired, Saturday, since the sinking first took place. Mr. Milne is now working 125 men. A week ago, Sunday, considerable headway had been made, and it was supposed the end of the difficulty was near. But Tuesday the sinking commenced again, as usual, and the embankment became as bad as ever. During the latter part of last week, also, the workmen gained some on the break, but by to-day it may be as bad as before. The gravel that is put in sinks straight down, but the soil on the east side of the track, towards the river, continues to slide. A large section, in the ravine across which the embankment formerly led, on the lower side, is still sliding down, and with such force that large trees are undermined and upset."

Central Pacific.

Work has been commenced on a new freight transfer boat which will be 330 feet long, 40 feet beam and 80 feet over the guards. She will be used for ferrying freight cars from Oakland to San Francisco. She is being built by the company, which is making a ship yard and permanent "ways" at Oakland, where all building and repairing of boats will be done.

Valley, of Virginia.

The reported reduction of the force at work on the grading south of Staunton has amounted simply to a transfer of men from some sections, where the work was well advanced, to others where it was behindhand.

Wheeling & Lake Erie.

The line is now located from the Ohio River, near Wheeling, northwest 108 miles to Lodi in Medina County, O. The grading is finished for 15 miles and work is progressing. Two lines have been run from Lodi to Sandusky and other lines are now being surveyed.

Utica & Black River.

The court has ruled that the injunction of George W. Flower against the Carthage, Watertown & Sackett's Harbor Railroad, enjoining them to retain \$9,000 of the bonds for the Utica & Black River Railroad, shall continue.

Montpelier & Shelburne Falls.

The preliminary survey has been completed from Shelburne Falls, Mass., nearly due north as far as Ludlow, Vt., and the engineers are now at work between Ludlow and Bridgewater, where it is proposed to connect with the line surveyed for the Montpelier & Rutland road.

The Minnesota Railroad.

The Railroad Commissioners have completed and published their schedule of freight rates for the different roads. The companies, or nearly all of them, have announced their intention of complying with the law as nearly as possible. Reductions are made on nearly all the lines, the largest being on the Milwaukee & St. Paul and Winona & St. Peter. The Commissioners' rules require that all freights shall be billed at the actual weight and 20,000 pounds shall be considered a car-load, except in cases of light and bulky articles, when the car-load shall be limited by the capacity of the car.

In all cases where shippers neglect to load or unload freights, the railroad companies may charge and collect not exceeding \$1.50 per car-load for loading and unloading lumber; \$1.00 per car for loading or unloading salt and cement; \$2.00 per car for loading and \$1.00 for unloading wood; 40 cents per ton for loading or unloading coal; \$1.00 per car for loading or unloading flour, and 1 cent per bushel for loading or unloading grain. All other classes, not above enumerated, the railroad com-

panies may charge not exceeding 40 cents per ton for receiving, handling and delivering.

These charges are not authorized to be made on freights in transit, in being transferred from one road or company to another.

Dividends.

Dividends have been declared by the following companies: Cleveland & Pittsburgh, 1% per cent., quarterly on the guaranteed stock, payable September 1.

Adams Express Company, \$2 per share, semi-annually, payable September 1.

Meriden & Bristol.

It is proposed to build a railroad from Meriden, Conn., northwest through Plantsville to Bristol on the Hartford, Providence & Fishkill, a distance of about 15 miles.

Portland, Rutland, Oswego & Chicago.

This company, it is said, has been reorganized, and efforts are being made to revive interest in the project and to induce certain prominent parties to take hold of it.

Erie.

Mr. Jewett, the new President, with Mr. Blanchard, Vice-President, Mr. Clarke, General Manager, and Mr. Chanute, Chief Engineer, has started on a trip of inspection over the road.

Mr. Hill, Superintendent of the Eastern Division, has issued a circular calling attention to the number of accidents which have been caused by carelessness of employees and announcing his intention of showing no mercy hereafter to any one convicted of carelessness or disobedience of orders. Hereafter, also, any employee who drinks any intoxicating liquor while on duty will be discharged.

Philadelphia & Reading.

This company gives notice that, in conformity with the stipulations in the general bond of the \$10,000,000 gold 6 per cent. improvement mortgage, 200 bonds of \$1,000 each have been drawn, and will be paid off at par October 1, 1874, either at the office in Philadelphia or at that of McAlmont Bros., London.

Richmond, Fredericksburg & Potomac.

The company has procured an injunction restraining the city authorities of Richmond, Va., from enforcing the ordinance which prohibits the use of locomotives on Broad street in Richmond.

South Mountain & Boston.

A contract for five miles of grading, from Swartwood, N. J., to Augusta, has been let to Clark & Deshler, of Pittsburgh, Pa. The work on the sections already let is progressing well.

Bangor & Bucksport.

The road-bed is being finished up and tracklaying has been begun. The timber for the bridge over the Penobscot is on the ground.

Railroad Taxation in Missouri.

In the various suits brought in the United States Courts to enjoin the collection of taxes under the present law, the arguments have been concluded and the case submitted to the Court. It is not known when a decision will be given, and it is thought probable that the case may be set over to the September term of the Circuit Court in St. Louis. The companies which applied for an injunction are the Atlantic & Pacific, Missouri Pacific, St. Louis, Iron Mountain & Southern and Chicago & Southwestern.

Mississippi River Rates.

A meeting was held in Chicago last week at which were present representatives of the Milwaukee & St. Paul, Chicago & Northwestern, Illinois Central, Green Bay & Minnesota and Chicago, Dubuque & Minnesota railroad companies, and the Diamond Joe and Keokuk Northern packet lines. It was resolved to put an end to the sharp competition in rates which has been going on for some time past on river freight. A general advance in rates was agreed on.

Kansas Midland.

This company has made temporary arrangements to run trains from Lawrence to Kansas City by the St. Louis, Lawrence & Western and Missouri River, Fort Scott & Gulf roads. It has also made a permanent contract for the use of 15 miles of the St. Louis, Lawrence & Western from Lawrence east to De Soto. The 23 miles of its own road from De Soto to Kansas City are under contract to be finished in September. It is said also that the Atchison, Topeka & Santa Fe has made arrangements to send all its cattle business over this line to Kansas City.

St. Clair & Carondelet Bridge.

This company, which proposes to build a bridge over the Mississippi at Carondelet, just below St. Louis, has been taking some steps towards the construction of its bridge and a board of engineers has been sitting in St. Louis, by order of the Secretary of the War, to consider the plans and location of the bridge. There is said to be much opposition to the new bridge both from the river men and the merchants of St. Louis.

Pacific Mail.

The Attorney General has decided that the failure to complete the new ships by the time specified (October 1, 1873) is not sufficient reason for the Post Office Department now to refuse to accept those ships and to pay the increased subsidies called for by the act of June, 1872.

St. Paul & Sioux City.

The General Manager, Mr. J. W. Bishop, has published a statement of the business of the two roads under his charge for the first half of 1874, which accompanies a letter to the Railroad Commissioners. The statements are as follows for the St. Paul & Sioux City road:

Earnings	\$254,298 20
Expenses (78 per cent.)	199,295 47

Net earnings	\$55,002 73
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Taxes, interest, insurance, etc., amounted to \$22,460.05, which leaves only \$32,542.68 to pay interest on the funded debt which amounted to \$82,947 82. The earnings per train mile were:

	Miles.	Cost.	Earn.
Passenger	64,148	\$1 23	\$1 12
Freight	57,179	2 10	3 19
	121,327	\$1 64	\$2 10

For the Sioux City & St. Paul the report is as follows:

Earnings	\$119,349 96
Expenses (82.1 per cent.)	97,970 93

Net earnings	\$21,379 03
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Taxes, etc., were \$4,324.49, leaving \$17,054.54 to meet payments for interest on bonds, rent of Illinois Central track, and new equipment, which amounted to \$112,115.93. For this section of the line the earnings per train mile were:

	Miles.	Cost.	Earn.
Passenger	50,967	\$0.726	\$0.752
Freight	49,879	1.223	1.682
	100,846	\$0.97	\$1.184

After representing the urgent necessity that the line should earn enough to pay interest on the debt, Mr. Bishop concludes thus:

"I am obliged to say, however, that under the circum-

stances, it will be impossible for either of these companies to concur in any reduction of the present rates, either for freight or passengers; and I am confident that if the cost of performing the service is admitted to have any relation to the price to be charged therefor, they cannot be considered either by the Commissioners or by the public as above the maximum of reasonable rates."

Chicago & Northwestern.

The shops at Clinton, Ia., are working now only five days in each week.

In the Winona & St. Peter shops also the time has been cut down to five days per week. The freight tariffs on the Winona & St. Peter are to be adjusted to the rates prescribed by the Minnesota Commissioners, although much complaint is made that the rates allowed that road are much lower than those for the Southern Minnesota. The reduction on grain and lumber, the two principal items, varies from 10 to 33 per cent., according to distance.

Boston & Albany.

The plans for the alterations in the Springfield depot have been approved by the other companies which use it, the New York, New Haven & Hartford and Connecticut River. Work will soon be begun.

Wallkill Valley.

The application of the removal of the trustees under the mortgage and for the appointment of a receiver has been dismissed.

The Wisconsin Railroad Law.

The arguments in the injunction suit against the Northwestern & St. Paul companies in the Wisconsin Supreme Court have been concluded, but the decision has not been announced. Much of the argument was as to the jurisdiction of the Court and its power to issue injunctions in such a case.

Monadnock.

An agreement has been concluded by the directors of the two companies for a lease of this road to the Boston, Barre & Gardner Company, with whose road it connects at Winchendon. The road is 17 miles long from Winchendon, Mass., northward to Peterboro, N. H.

Rhinebeck & Connecticut.

The force of tracklayers has been increased and the work is being pushed forward steadily. Considerable freight is already coming over the finished part of the road, although no regular trains are yet run.

Alleghany Valley.

At an adjourned meeting of the creditors held in Pittsburgh, August 12, a proposition from the Pennsylvania Railroad Company to lease the Alleghany Valley Railroad was received. After some discussion it was voted on and accepted. The details of the proposition have not been received.

Illinois Central.

The Land Department reports for July sales of 1,071 acres construction lands for \$8,411.45 and cash collections of \$39,452.90.

The Traffic Department reports as follows:

	In Illinois, 707 miles.	In Iowa, 442 miles.	Total, 1,109 miles.
Freight.....	\$324,228 00	\$67,323 00	\$392,251 00
Passengers.....	105,329 50	41,140 70	146,470 20
Mails.....	9,072 08	3,059 33	12,131 41
Other sources.....	70,927 92	2,410 67	73,338 59
Total, July, 1874.....	\$510,257 50	\$113,933 70	\$624,191 20
Actual earnings, July, 1873.....	548,372 78	136,467 55	684,840 33

This is a decrease of 7 per cent. in the Illinois earnings, of 16 1/4 per cent. in the Iowa earnings and of 8 1/2 per cent. in the total.

Chesapeake & Ohio Canal.

At the monthly meeting of the directors, August 7, it was stated that the net earnings for July were \$44,656.62, and the balance on hand at the close of the month, \$86,789.40. The directors appropriated \$50,985 to pay the coupon on the preferred construction bonds which was due July, 1860. It will be paid in Baltimore, August 20.

Chester & Delaware River.

This company is about to build the extension of its road from Chester, Pa., northeast to Ridley Junction on the line of the Chester Branch of the Philadelphia & Reading, the old line of the Philadelphia, Wilmington & Baltimore. The distance is about four miles. Much pile bridging will be required, the contract for which has been let to Powell & Son of Philadelphia.

St. Louis & Florissant.

The stockholders met in St. Louis, August 8, and voted to authorize an issue of bonds sufficient to pay all debts and iron the road. It is graded for 16 miles, from St. Louis west to Florissant.

Atlanta & West Point.

At the annual meeting in Atlanta, Ga., July 25, it was voted to authorize the issue of \$100,000 of 8 per cent. bonds having five years to run, which are to be exchanged for the bonds falling due this year, or else sold and the proceeds used to pay such bonds in cash.

The Meeting of Northwestern Railroad Commissioners.

The railroad commissioners of Illinois, Iowa, Wisconsin and Minnesota were to meet in Dubuque, Ia., August 12. The principal points to be considered at the conference were the providing of a uniform system of reports for the railroads of the four States and a uniform fiscal year; to establish, if possible, a uniform classification of freights, so that concurrent rates may be adopted for roads running through two States; and to take action looking to uniformity of legislation in the four States.

Pennsylvania.

Freight trains were dispatched for the first time, August 10, from the new freight depot on Delaware avenue in Philadelphia. The freight cars are drawn to and from this depot by locomotives over the new track connecting with the branch road on Washington avenue, thus avoiding the necessity of hauling cars into the city by horse power.

Mobile & Ohio.

The grading of the Starksville Branch, 4 1/2 miles of which have been in use for some months, is nearly completed. The whole 11 1/2 miles of the branch is expected to be ready for use by the end of October.

Atlanta & Richmond Air Line.

A meeting of the first-mortgage bondholders was held in New York, August 7. The committee appointed at a previous meeting reported that the Pennsylvania Railroad Company had agreed to transfer the majority of stock which they held to three trustees (who shall have power to elect a majority of the directors). The meeting appointed Mr. Moses Taylor, Judge O. H. Palmer and Mr. R. A. Lancaster to fill the position of trustees. The meeting then determined on the following course of action: A supplementary mortgage is to be issued explanatory of the first mortgage, and calculated to facilitate a foreclosure, if such should at any time be necessary.

The present second mortgage of \$2,600,000 is to be canceled, and the holders of bonds to be recouped with preferred stock

to the same amount, of which stock the Pennsylvania Railroad Company will put up \$1,250,000. A new second mortgage to the same amount, \$1,250,000, is to be issued, and the bonds sold with the stock mentioned above for a bonus, and the proceeds to be invested in rolling stock and the building of machine shops, &c.

Six coupons on the first-mortgage bonds, commencing with last January, are to be funded in the form of an income bond bearing seven per cent. interest, and payable in ten years from date, and will be secured by a deposit of the coupons in the Farmers' Loan and Trust Company. By these means the meeting considered that the line could be worked to profit, and the interests of the bondholders and owners of stock be protected. About \$3,500,000 was represented, and holders of \$4,100,000 out of the whole \$4,250,000 first-mortgage bonds have agreed to be represented by the committee.

Fall River.

The right of way for the whole length of this new line, which is to connect New Bedford, Mass., with Fall River, has been secured, and two-thirds of the sum needed has been subscribed.

Chesapeake & Ohio.

The round-house at Staunton, Va., with the blacksmith shop and two locomotives, was burned August 5, the loss being estimated at \$50,000. Several engines were in the house when the fire began, but all but two were got out with slight damage.

United States Contracts.

Lieut.-Col. John Newton, Corps of Engineers, will receive proposals at Room 31, Army Building, corner of Greene and Houston streets, New York, for the following work: For the extension of the breakwater at Swanton Harbor, Vt., and for the extension of the breakwater at Burlington, Vt., until August 26 at noon.

Col. O. E. Babcock, Corps of Engineers, will receive proposals until noon on September 4, at the office of Public Buildings and Grounds, Washington, D. C., for the construction of a substantial iron and masonry bridge and of a causeway across the Anacostia, or Eastern Branch of the Potomac River. The length of bridge and causeway will be 1,700 feet.

Atlantic & Lake Erie.

At a meeting of the directors in Columbus, O., August 6, a contract was made with B. R. McDonald, of Bucyrus, O., for laying eight miles of track from New Lexington, O., to Moxahala, the work to be completed in 60 days. The grading from Bucyrus to Mount Gilead has already been let, and a contract has been made with the Columbus Rolling Mill Company for \$75,000 worth of rails.

Burlington & Southwestern.

In the United States Circuit Court at Des Moines, Ia., a bill has been filed for the foreclosure of the first mortgage on this road. The bill is filed by the trustees, and E. B. Ward and James F. Joy are made defendants with the company.

The Pacific Railroads and the Percentage on Net Earnings.

The Secretary of the Treasury is preparing a formal demand on the several Pacific railroad companies, specified in the act of Congress passed last June, requiring the payment of 5 per cent. of their net earnings to the Government, as prescribed in the act of July, 1862. If the demand is not complied with in 60 days, the Attorney General will be notified to begin suit for the amounts unpaid.

A Land Grant Railroad Decision.

The Attorney General of the United States has given his opinion on two points. First, that the operation of the conditions made in grants of public lands in aid of railroads does not depend on the rules of common law, but upon the intentions of Congress, as gathered from the language used in the grant itself. Second, that the grant of lands made to the State of Wisconsin in 1856 to aid in the construction of certain railroads, in which it was provided that "if said roads are not completed in 10 years no further sales shall be made and the land unsold shall revert to the United States" is determined as to the lands unsold at the time by the failure to complete the roads as specified in the act. No congressional action or judicial proceedings are necessary, but such unsold lands will be reunited to the public domain by the publication of an order by the Secretary of the Interior restoring them to settlement and market.

This opinion appears to have special reference to the St. Croix land grant.

Blue Ridge.

The postponed sale of this road in bankruptcy will take place at Charleston, S. C., October 22. The sale includes the road and property of the Blue Ridge Company of South Carolina, the Blue Ridge Company of Georgia and the Tennessee River Railroad Company of North Carolina. There are 33 miles of finished road, from Anderson, S. C., northward to Walhalla, and a considerable amount of very costly work has been done on the grading in South Carolina and Georgia. The sale also includes 1,650 shares of stock in the Pendleton Railroad Company, 5,490 in the Blue Ridge of Georgia, and 4,400 of the Tennessee River Company, being a majority of the stock of each company.

The bankruptcy charges and taxes due and 20 per cent. of the remainder of the bid must be paid in cash at the time of sale, the rest of the purchase money in 60 days.

New Mail Route.

Mail service has been ordered over the Des Moines & Minnesota Railroad, from Des Moines, Ia., to Ames, 30 miles.

Gilman, Clinton & Springfield.

The case of this company came up before the Circuit Court at Bloomington, Ill., August 4, on a motion to substitute the directors of the company for the present receivers and to put the road in their hands. The grounds of the motion are that under the present management no funds are accrued for the payment of interest on the funded debt. If the directors are in possession of the road they can make arrangements for funding the coupons now due and that falling due September 1, and thus prevent a foreclosure of the mortgage. A large part of the bondholders are said to be in favor of such an arrangement. The efforts to get a decree under the cross-bill filed by Morton, Bliss & Co., and others are alleged to be in the interest of the Illinois Central which desires to secure the control of the road. The motion was referred to a master in chancery to take testimony.

Cleveland, Columbus, Cincinnati & Indianapolis.

There has been put on record in Indiana a consolidated mortgage for \$7,500,000. The new mortgage is intended to cover the existing mortgage, which amount to about \$3,450,000, and a new issue of \$4,050,000. Of the bonds to be issued under the new mortgage a sufficient number is to be retained to exchange for all outstanding issues.

Memphis, Carthage & Northwestern.

An effort is being made to secure the extension of the road westward about 24 miles to Oswego, Kan., in Labette County.

Louisville, Cincinnati & Lexington.

The suit brought by the Newport & Cincinnati Bridge Company is against this company and (nominally) the Little Miami, and the Pittsburgh, Cincinnati & St. Louis. These companies contracted to use the bridge, to pay tolls therefor and to guar-

antee a certain income. The two last named companies have fulfilled their share of the agreement, but the Louisville, Cincinnati & Lexington has failed to do so. The bill alleges that by proper management during the pendency of this suit the road may be made to pay all charges, and prays that a receiver may be appointed.

It is said that other creditors will also file similar bills.

Chicago & Pacific.

The Illinois Circuit Court has refused to grant an injunction to restrain this company from operating its road on Hawthorne Avenue in Chicago. The Court held that the company had a right to the use of the street and any claim of property owners for damages was a question for a jury.

New York, Providence & Boston.

The second track is now completed from Providence, R. I., to Stonington, Conn., making a double track for 50 miles out of the 62 belonging to the company.

Chester & Lenoir.

Work is in progress on this narrow-gauge line from Chester, S. C., northward into North Carolina.

Galena & Southern Wisconsin.

The St. Paul (Minn.) Press says: The bonds of the Galena & Southern Wisconsin Narrow-Gauge Railroad, to the amount of \$100,000, have been placed to the satisfaction of the directors. This assures the completion of the road to Platteville from Galena.

Green Pond.

This road is now completed and the first train passed over it August 3, the train consisting of 20 cars loaded with 200 tons of iron ore. It is four miles long, from the New Jersey Midland at Charlotteburg, N. J. southward to the Green Pond Mines in the town of Rockaway, Morris County. It is intended mainly for the transportation of iron ore, and will be a feeder of some value to the Midland. It is to be extended some twelve miles to the Morris & Essex at Port Oran, by the Timber Brook Railroad, work on which will soon be begun.

St. Louis, Iron Mountain & Southern.

It is stated, on authority of officers of this company, that the company has negotiated in London about \$1,000,000 of its second mortgage bonds at 70 per cent. currency, and \$1,500,000 of its consolidated mortgage bonds at 71 per cent. currency. Also that the company has lately reduced its floating debt more than one-half, and expects to fund most of the remainder (about \$1,600,000) within the year.

This company, like the Atlantic & Pacific and others, has applied to the United States Circuit Court for an injunction to restrain the levying of taxes on the road at the present assessed valuation.

Baltimore, Pittsburgh & Chicago.

Iron for this road is being received at Chicago, and track-laying has been commenced on that end of the line.

Track has been laid on the eastern end of the line to a point in Indiana 44 miles westward from the late terminus at Defiance, O., and 132 miles from the junction with the Lake Erie Division of the Baltimore & Ohio.

Frankford & Breakwater.

The track is laid to Frankford, Del., the southern terminus, 16 miles from the Junction & Breakwater road at Georgetown and 5 1/2 miles beyond the last point noted. An excursion train was run through to Dagoboro, 14 1/2 miles from Georgetown, last week, and regular trains will soon be put on.

North Pacific Coast.

Track is laid to San Rafael, Cal., 10 miles from the southern terminus at Sausalito on San Francisco Bay. Construction trains are running over the road. Work on the grading northward is being pushed forward.

Springfield, Athol & Northeastern.

At the recent annual meeting it was stated that \$71,000 out of \$300,000 first mortgage bonds had been sold at about 90. It was thought that the remainder could be sold without difficulty, and that another year's operation of the road would put it on a sound basis.

New Castle & Franklin.

Tracklaying has been commenced on the extension of the road from Mercer, Pa., northeast to the junction with the Jamestown & Franklin road, at Stoneboro. The distance is about 12 miles.

Contributions.

Crossing Signals.

ROOM NO. 12 CHAMBERLAIN'S BLOCK,
CLEVELAND, Ohio, July 24, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I do not remember having seen in your journal any mention of the very admirable practice established some years ago on the Lake Shore & Michigan Southern Railway, and still in force on that road, in accordance wherewith monthly business conferences (at which the attendance of each of the Division Superintendents, and of the General Master Mechanic, General Master Car-Builder and Superintendent of Telegraph of the road is required, and at which the Chief Engineer of the line, or one of his assistants, is usually present) are held at the office of the General Superintendent of the line. The General Superintendent is *ex-officio* Chairman of these meetings, and the Superintendent of Telegraph acts as Secretary. Matters affecting the condition, discipline and business of the line are at these conferences taken up in a prescribed order, and fully and freely discussed.

Suggestions, by whomsoever made, are, if they relate to matters within the jurisdiction of the meeting, considered and acted upon, or disposed of in accordance with the sense of the meeting.

Each officer is, in turn, called upon to present to the meeting any matter that he may wish brought to the attention of his associates, or any of them.

The five or six hours devoted monthly to these conferences are usually very fully and profitably occupied, and the beneficial influence of the gatherings, extending in various directions and affecting the social as well as the business relations of the persons attending them, is quite marked.

When Mr. Devereux resigned his position as General Manager of the Lake Shore & Michigan Southern Railway, and accepted a like position on the Atlantic & Great Western Railroad, he established on the last-named road this practice, the good effects of which he had seen on the Lake Shore; and Mr. Cooper, who left the position of Assistant General Superin-

tendent of the Lake Shore to assume that of General Superintendent of the Atlantic & Great Western, continues the practice, very much to the advantage of the line of which he has charge.

At the time of the establishment of these meetings on the Atlantic & Great Western the question as to what is the best system of signals for use at railroad crossings at grade was prominently brought before the officers of the line, and was quite thoroughly discussed, as were several other matters of interest to railways generally. These discussions developed, as discussions of such questions generally do, the existence among the participants therein of widely differing views of the subject immediately under examination, as well as of men, things and business affairs generally, and were, moreover, very interesting, because they brought out not only many valuable statements of facts and experience, but also very good indications of the qualities of the men who took part in them.

Reports upon examinations and inquiries ordered at some preceding session are handed in at almost every meeting, and the road has derived much benefit from the action taken from time to time in accordance with the indications developed by these special inquiries.

The following paper was written by the undersigned for presentation to the Atlantic & Great Western meeting held August 21, 1873, at which meeting discussion of the crossing-signal question was in order. Most of the paper was read at that meeting, and several of the suggestions therein contained have been acted upon with good results.

Believing that the practice therein recommended, or something equivalent thereto, should be adopted at all points where one railway crosses another at grade, I submit the paper, through your journal, to the consideration of those interested.

J. M. GOODWIN.

At almost every point in this country where the track of one railroad crosses another at grade, there are special means provided for the purpose of regulating the movements of trains, so that collisions between the trains of the respective roads shall not take place.

At each such crossing there is commonly maintained a signal station, attended day and night by watchmen or signal men, whose sole duty it is to look out for trains approaching the crossing, and to manipulate according to detailed instructions certain signals that have been devised for the purpose of indicating to each train or engine wishing to pass the crossing whether or not it may proceed without danger, either to itself or to any train or engine on the opposing road.

The rules and regulations intended to govern the operations of the signal men at the crossing, and of the train-men of both the roads using the crossing, having been carefully considered by the superintendents of the roads, acting in concert, are set forth and explained in the printed instructions issued by the said superintendents, respectively, for the information and guidance of their men.

These rules, from considerations of safety and in compliance also with State laws, generally, if not invariably, require that every engine or train shall always before passing the crossing come to a "full stop" within certain specified limits (A), and that in no case shall any train or engine attempt to pass the crossing, except when the signal is "right" for it to pass.

The rules furthermore generally say that, when the signal man has set the signal to indicate the way clear for a certain train to pass the crossing, he must not change its position until after the train for which it was so set shall have crossed.

The rules generally also specify that in case a train of each road is waiting for signal to cross, precedence shall be given according to the class of the trains; and that of two trains of like class the train of the elder road shall have precedence (B). It is usual also to order engineers to keep their trains entirely under their own control when about to pass a crossing; and the rate of speed not to be exceeded while passing is usually set at six miles per hour.

By some codes the engineer is required, whenever he cannot clearly see the signal at the crossing, as in case of fog, or from any cause, to send his fireman forward to the crossing, and to be absolutely sure that the way is clear before proceeding. There are some crossings at grade at which no fixed apparatus is provided for signaling trains. The fixed signal stations, targets, and other apparatus are under the following-named conditions often considered unnecessary, or not as well calculated to secure immunity from accident as are hand signals.

1st. In cases where a road running but few trains, and those of such a character that a delay of a few minutes is a matter of inconsiderable importance, crosses another road, and where rather than incur the expense of building and maintaining proper signals the minor road undertakes the responsibility of looking out for the safety of all trains at the crossing; in other words, where the trains of the one road undertake to "dodge" across the line of the other and opposing road (C).

2d. In cases where the passage of trains over the crossing, first on one line and then on the other, is almost incessant; also where there are several crossings so close together that if a mechanical signal of either of the kinds generally used were placed at each crossing confusion would inevitably follow. Instances of the conditions described under the second head are to be found in large "yards," and at terminal and other grounds occupied jointly by two or more roads.

Wherever the track of one road connects, by means of a switch, with the track of another road, and the trains of the first road come in upon the line of the other and occupy it for some distance, finally leaving it by another switch, (whether in so doing the trains of the first road actually cross the second road or not) the conditions at each switch are equivalent to those existing at a "crossing" at grade, although between the switches, which may be several miles apart, the foreign trains are rated and governed exactly as if they belonged to the road over which they are passing. At

any "junction," whether it be a junction of two or more branches operated under a single administration, and under one and the same code of rules, or a junction of two or more roads, operated under distinct administrations and sets of regulations, the precautions demanded by the conditions are, in all essential points the same as at a crossing. In some instances two roads jointly use a signal-track bridge, or a certain section of signal track roadway, without making any switch connections between the two tracks; but, by using crossing frogs in one rail, make the two tracks occupy to all intents herein considered, one and the same ground. A case of this kind may be observed at the outer swing bridge across the Cuyahoga River at Cleveland, where the Lake Shore & Michigan Southern and Cleveland & Pittsburgh roads jointly occupy the bridge. Sometimes in yards, and sometimes where a double track railroad passes both its tracks through a tunnel only wide enough properly to accommodate one track, this same method of interlacing rails is used, the conditions in these cases also are, as far as the necessity for determining the rights of trains and regulating their movements, is concerned, essentially the same as at crossings at grade.

Continuing this analysis, we find that where the second track of a "double-tracked" road is not entirely complete, but is interrupted at certain points at which it is necessary that trains on the second track enter upon the continuous or "main" track, and run upon the same for some distance, the trains so entering the main track bear to the other trains on that track the same relation that trains of a foreign road bear to the trains of the road upon which they enter and run, as in the case above cited; and thus at the points (or "junctions") at which the "second" track joins the "main" track, precautions similar in character to those necessary at "crossings" should be observed. Any point at which one track of a road joins another track of the same road, as where a siding joins a main track, is in some regards a "junction," and, with certain modifications, precautions like those prescribed for crossings should be observed at such points (D.)

We intend in this paper to consider more particularly the mechanical appliances and systems of signals used at crossings at grade, and it will be a digression to enter upon a discussion of the question (highly important, and indeed of vital importance, to you as men charged with the conduct of the affairs of a great railway, a world in itself) as to the most effective means for cultivating and maintaining among the operatives of your road a proper *morale*—a proper appreciation of and conscientious attention to duty; yet I believe it will be profitable to suggest here that a presentation to you, as a body, of a comprehensive view of this matter, too little considered, would be productive of good results; just as the presentation of these other matters tends to widen, or at least modify with good effect, your views of things.

I say thus much because of the conviction in my mind that in the operation of the great machine that, as a whole, is known as a railroad, the harmonious reciprocity in the working of its very many parts, so absolutely essential to the equable, uniform, and in all respects truly economical movement of the ponderous mechanism, can be secured only by organizing the great body of the road on the plan that governed the composition of the human body, in which one intelligence "animates and informs" the entire system, and in which the most remote member, with instantaneous and keen appreciation of the essential quality of whatever it may have to deal with, as instantaneously, through the media of the proper channels, communicates its impressions and conclusions thereunto to the central intelligence, which, by the reflux of the communicating wave, orders appropriate action in the premises.

We are now especially considering the question as to what is the best combination, for certain purposes, of sundry pieces of insensible wood and iron. The fact that we are so considering this question argues that we have already considered the best means for educating our men to that intelligent and conscientious handling of our semaphores and locomotives, without which the one is worse than useless and the other an engine of destruction. If we have not carefully examined this matter, or if we have pondered it only as individuals, and not in association, then I hold it is our duty to consider the subject, and to consider it together, to the end that there be established for the discipline of the employees of the line a system approved by the concurrent judgment of this body of experienced men, each of whom, as he has reached his present position by merited promotion from the ranks, should be well able to estimate the effect of any proposed regulation upon the class of operatives of which he has special knowledge.

At our crossings, junctions and switches, and at all points, and under all circumstances, at which or by which special care in the handling of trains is made necessary, we must secure, in order to be thoroughly guarded against disaster, an exact discharge of a thoroughly understood duty by intelligent, capable and conscientious men.

The signals at crossings, as well as those used elsewhere on American railways, are of as many forms, almost, as there are railways; and the rules for operating them are by no means uniform throughout the country; nor are those rules based on any system uniformly understood and agreed to by railway officers. As each point involved in this consideration is mentioned, I feel a strong desire to extend the scope of this paper so as to make it comprehend the whole subject suggested by these several points, and I trust that I may soon have an opportunity for presenting for your consideration, in the form of a pamphlet, a more comprehensive view of the matters naturally associated with the subject of our immediate inquiry.

I am specially led to call attention here to the necessity for uniformity in signals, and for the adoption by the roads of the country of some system upon which their rules affecting signals shall be based. Signals by motions of the hands; by motions of hand-lamps, or of flags;

by variations of the position of targets of many kinds, or of balls or lamps; by sound, as by whistles, or bells, or gongs, or torpedoes; and by variations of color, as of balls, targets or lamps, are in universal use; but there is no uniformity in the several sets of rules governing the manipulation of these things on the several roads of the country.

The rules of one great road specify that a hand-lamp "moved up and down" is a signal to stop a train or engine; while on another great road (that has at more than one point transfer and other connections with the line first alluded to) the "moving of a hand-lamp up and down" is a signal for backing a train or engine. On one road one sound of the locomotive whistle is for "brakes off," and on another the same sound is for "down brakes." On one of the great roads of the country the rules regarding "signals" commence by specifying, emphatically, that "red lanterns and red flags must never be used as signals of caution only but always of danger," and almost immediately afterward specify that a red light at a certain named important signal point will indicate that the way is clear for trains of a certain division; at another point that the track is right for trains of a certain class; and at still another point that the way is clear for trains moving in a certain direction. Now here is confusion thrice confounded!

At a certain railway crossing at grade a red light is the signal for safety for one of the two roads that use the crossing.

These facts, significant and suggestive, are not, as might very well be imagined, "exceptional" facts, for evidence of the existence of which we must make special search. The conditions indicated exist close at hand, and all about us; and if we take the preliminary practical steps that shall lead to the needed radical reform in these matters we shall do a good work.

The semaphores at railway crossings at grade usually carry emblems, or signs, of some one of the following named forms, and sometimes a combination of two, or more, of the forms, viz.:

1st. Targets of wood or sheet-metal, circular, square, or diamond-shaped, fixed on a vertical shaft, either singly or one above another, in connection with similar shapes at the two ends of a bar fixed horizontally across the vertical shaft.

2d. Broad arms of wood or sheet-metal pivoted, either in their middle or at one of their ends, upon the mast or pole supporting them.

3d. Balls, or bodies of other shapes, made of canvas, stuffed, or of metal sheets, or of basket-work, suspended from arms projecting from masts.

4th. Pendulum-arms hanging from supports extended over or across the railway tracks.

I have noticed among railroad men and others a hesitation in the use of the term "semaphore," which arises, as I believe, from an uncertainty as to whether the name should be applied to the whole apparatus for signal-making or only to the arms or targets that are parts of the apparatus. If we are to use the term at all, we should agree as to what we intend to designate thereby.

The word "semaphore" is derived from two Greek words meaning respectively "a sign" and "to bear." Thus if the composition of the word were strictly considered only the tower, mast, or other structure that "bears" the "signs" would receive the name "semaphore," but in practice the whole structure, masts, signs, and all, is so named.

Some of the lexicographers tell us that a "semaphore" is a "telegraph." The word telegraph is derived from two Greek words meaning respectively, "at a distance" and "to write." The instrument originally called a telegraph was a "semaphore," and was used to transmit intelligence from point to point by means of signals perceptible only by the eye. We have in these days set apart the word "telegraph" to designate the combination of electro-magnetic batteries and machines, with their connecting wires, by means of which we now actually do "write at a distance." The semaphore does not "write at a distance," nor at all, and telegraph and semaphore are not synonymous. At any rate we will, if you please, when we wish to mention the apparatus at a crossing or junction (composed of a mast, attached arms, etc.), call it a semaphore.

The rules laid down for the government of engineers explicitly prescribe that every train and engine must be brought to a "full stop" within certain limits before passing a crossing. As this is the case it is obviously the duty of an engineer approaching a crossing to have his train fully in hand and to make sure of stopping as required. He should not consult the crossing signal prior to stopping. Only when his train has come to a stand-still should he turn his attention to the signal.

Frequently the signal is so arranged that when it opposes a train approaching on one of the intersecting roads it indicates the way clear for a train coming on the other line; but at some junctions and crossings a signal is prescribed which, when displayed, indicates that no train can pass (E.)

In case of the use of a number of targets, of uniform shape, fixed to permanently vertical or horizontal arms, as above described, the necessary signals are made by rotating the shaft of the semaphore, and thereby changing the number of the targets seen by the engineer on either road.

Where square or diamond-shaped targets are used in connection with circular ones, the rotation of the shaft produces changes in the form as well as in the number of the targets seen.

Where pivoted arms are used the signals are given by changing the inclination of the arms, presenting them diagonally, vertically, or horizontally.

Where balls, or bodies of other shapes, are used they are made to indicate certain conditions of things by changes in their altitude, by hoisting or lowering, or by showing a red ball for one condition and a white ball for another, thus signalling by changes in color.

Where the pendulum-arms are used the signals are given by the condition of rest or of motion of the arms; when

an arm is *swinging*, across a track, the train on that track may proceed.

Lights of different colors are used at night to indicate the form, the inclination, the altitude, or the condition of motion or of rest, of the several targets, arms, balls, etc.

Where the signals are made by rotating the shaft of the semaphore it is a common practice to combine with the targets one or more large lanterns which at night show a red light along the blocked track and a green or white light along the open line, and in such cases the signal at night is given by color, or by color and number combined.

Where pivoted arms are used the inclination of the arms at night is usually shown by red lights; but as lights of any color would serve the same purpose, the signal in no wise depends upon color for its efficiency.

Collisions at crossings occur quite frequently, and in most instances cause much damage. When passenger trains are involved, loss of life generally follows such collisions.

A collision of this kind is almost invariably the result of some obscurity or insufficiency in the rules intended to govern the signal-men and trainmen; some insufficiency of the signal apparatus or of the train brakes, a lack of intelligence and capacity in the persons selected for signal-men, or in a lack of discipline, equivalent to insubordination, among locomotive drivers and other employees. It is not always the fact that only the superintendents directly in charge of a crossing are responsible for such insufficiencies of apparatus and injudicious selections of men. Not infrequently insufficient apparatus and men of inferior intelligence and ability are placed, or continued at crossings and elsewhere in spite of efforts made by such superintendents to procure authority to make betterments. The superintendents in charge are, however, to be held responsible for the efficiency of their rules, and for the discipline of their men.

Neither are collisions at crossings always referable to the causes above named. One can readily imagine a combination of circumstances under which, while a train passing over a crossing, after strict compliance with rules, might be run into by a runaway engine, with or without train attached, coming up at a high rate of speed on the intersecting road.

Where trains in approaching a crossing descend a steep gradient there is an added element of danger, inasmuch as there is an increased probability that some train, because of a frosty rail or insufficient brakes, will escape the control of its engineer and brakemen and run into a crossing train (F.)

Each man in this meeting has probably had personal knowledge of at least one instance in which, without having previously indicated by word or manner that he was not in full possession of all his powers of perception, an engineer has, apparently with deliberation, run his train or engine directly into a most terribly dangerous position. I have in mind one instance where an engineer took his train out of a siding directly into the face of an express train approaching at a high rate of speed; and another where the engineer, instead of shutting off steam on approaching a crossing, over which a train on the opposing road was at the time slowly passing, increased his speed and ran through the opposing train.

I am satisfied that no one was more astounded at these performances than were the engineers themselves. I believe that the man who ran out of the siding as described was asleep when he did it. It is not difficult to imagine the sudden yielding to an insane impulse of a mind unsettled by long-continued strain or fatigue that resulted in the running of the engine through the train at the crossing. We are glad to know that things such as this last very rarely happen. In view of the possibility that the lapses of the reasoning power that led to these acts were produced by over-fatigue, we should take care not to overwork our engineers, and should not allow them to overwork themselves.

In reviewing our statement we find that our signals at crossings, whether made by

1. Motions of the hand, arm, or lamp;

2. The condition of motion or rest as opposed to each other, in targets, or lamps;

3. Changes of inclination in arms or targets;

4. Changes of altitude in balls, etc.;

5. Changes in form of targets;

6. Changes in number of targets or lamps;

7. Changes in color of targets or lamps;

or by any combinations of these characters or conditions, are all addressed to the eye alone.

In this connection we should notice the following facts:

(1.) It is well known that some persons are unable to perceive the difference in color between a red object and a black one placed beside it; among other persons, able readily to distinguish colors, there is a wide difference in the impressions produced upon the eye by any given color.

(2.) The most practiced eye fails under certain circumstances to distinguish the difference between a light of a certain power seen at a given distance and a less powerful light seen at a lesser distance.

I have called attention to this fact in some remarks on marine signals in our article headed "Protection to Travelers" in the RAILROAD GAZETTE of November 30, 1872.

(3.) Thick weather and fogs obstruct the sight; and by fogs the sight is sometimes not only obstructed, but perverted, and objects are made thereby to appear distorted; and confusion as to distances and altitudes is caused in the mind of the observer.

We have often known in this part of the country fogs so thick as to entirely obscure any object at a distance of 75 feet from the eye.

(4.) Under certain circumstances the eyes inevitably convey false impressions to the brain. To demonstrate this fact extend your arm and raise one finger; fix your eyes upon this finger; now, still holding up the finger, throw your sight forward to the sash-bar of the window or to any more distant object; you will now see, distinctly, two fingers. Thus you may

sometimes see two men, two flags, two target-balls, two objects of any kind, where only one exists.

In looking at familiar objects we sometimes see them assume strange and fantastic shapes, and a strong effort of the will is necessary to break up the illusion. A pattern on the wall paper suddenly presents to us the distinct profile of a human face. In the pictured weeping willow hanging over the tomb at St. Helena we look long for the profile of Napoleon's face; suddenly the outline we seek is revealed.

There is something quite startling in this. If we see it finally so distinctly, why did we not see it at first?

A narrow arm if whirled about a pivot with a certain rapidity will appear to us as a circular disc. Our eyes often momentarily deceive us, and in some moment of mistaken conviction we, as engineers or signalmen, may do the exact opposite of what we ought to do.

I think that in moving trains on a railway we ought not to rely upon signals addressed to the eye alone.

I submit for your consideration, in connection with the subject under discussion, the following suggestions, which are here designated by letters referring to similar letters to be found in the margin of the body of this paper marking the special matter to which the suggestions respectively apply.

(a.) The rules generally require trains to stop within a certain specified distance of the crossing, as "within 300 feet;" on some roads trains are required to stop at some point "not more than 200 feet nor less than 200 feet from the crossing."

The engineer should be required to bring his engine to a stand still exactly opposite a certain post set up, preferably, within one hundred feet from the crossing. The post should be set at a point from which the view across to the stopping post on the opposing road is entirely unobstructed.

No latitude should be allowed the engineer as to his stopping place further than this: that he may stop before he reaches the post, provided it is necessary to do so in order to be sure of stopping at the post when he reaches it. The order for stopping opposite the post and before passing it should be unequivocal.

The intention in this arrangement is to place the stopping-post so near the crossing that in the space between the post and the crossing a train cannot gather impetus enough to prevent the immediate stopping of it by the brakes in case of necessity. What that necessity may be no man can say, and we must have our trains under control at these points.

The necessity for a clear view between stopping posts, as well as the insanity of ever "taking anything for granted" when handling trains, is illustrated by a very recent occurrence at a crossing of two roads in Michigan. At this crossing a certain position of the signal blocks both roads. A train approached the crossing on each of the two roads. The signalman set the block-signal; both trains stopped. The signal was then set giving the train on Road No. 1 the right to cross; this train started, as it had a right to do. The train on Road No. 2 also started, and the two engines came together on the crossing. The engineer of train No. 2 said that he did not see nor hear train No. 1, and seeing the signalman moving the target he supposed it must be for him. He did not look at the target. If he had looked at it, with the idea impressed on his mind that no other train was at the crossing, he probably would not have comprehended the significance of the signal at once. If there had been a clear view across the space between the two engines as they were standing still, the engineers would certainly have seen each other. Engineer No. 2 would have understood that No. 1 had the right to cross first; or, if he had made a mistake in that respect and believed that his own train had the first right to the crossing, the starting of No. 1 would have caused him to look at the target, which under the circumstances governing in this case he did not do.

I cannot say exactly how far from the crossing these engines were when No. 2 started, but I believe each was several hundred feet distant from the intersection point. If each road had had a stopping-post within 50 or 75 feet of the crossing, the collision would not have taken place; or if it had taken place the danger to property would have been but slight.

(b.) When we find a rule specifying that when trains of like class are at a crossing the train of the elder road shall have precedence, and that when trains of different classes are waiting to cross, the train of superior class shall take the road ahead of the other, we understand it as intended to guide the signalman at the crossing, wherever there is such a signalman. Engineers at a crossing where there is a signalman should be governed by the signal, regardless of any rule establishing precedence; and the man in charge of the crossing-signal should not be hampered by any rule requiring him to discriminate between trains according to class, or age of road. The consciousness of the existence of such a rule may cause him to hesitate some time when hesitation will involve disaster. He should be instructed to give trains the road according to the circumstances affecting them respectively, and he should be a man able to decide promptly and intelligently in any question of the rights or necessities of trains in the premises. I wish to avoid establishing in an engineer's mind the idea that when he is running a passenger train he has always a right to pass ahead of a freight train. If he has that idea he will be led to look at the train standing on the opposing track and neglect looking at the crossing-target for information as to his "rights."

(c.) It certainly seems to me that no crossing should be operated without competent signal-men stationed at it.

(d.) The rule quoted below has been adopted on the Lake Shore & Michigan Southern Railway:

"Whenever one passenger train is to meet another passenger train at a station, whether at a regular meeting point or upon an order from the Train Dispatcher, both trains must come to a full stop between the switches at the place of meeting."

This is a very proper rule, and should, I think, be enforced on every line in the country.

Several American roads have adopted a rule, intended to guard against accidents of the kinds caused by misplaced switches, which orders that no train may pass any station without coming to a stop, unless a white signal be shown at the entrance switch; and all trains must approach the entrance switch under the full control of the engineer.

Under this rule only trains not carded to stop at a certain station need be white-flagged at that station.

On some roads express trains are not limited as to speed when passing the entrance switch and the station, provided they are white-flagged at the entrance switch.

I would advocate the more cautious practice.

(e.) At some points this signal indicating that "no train may pass" is always set immediately after the passage of a train on either line, and remains as a block signal until after the succeeding train has arrived and stopped near the crossing. At other points it is used only when some point on the road beyond the signal post in the direction in which the train signalled is moving, is blocked—as when a draw is open, or the like.

While we continue to rely upon signals addressed to the eye alone for the government of trains at crossings, it seems to me that the use of a block signal at such points is advisable, principally because the movement of the target after the train arrives in front of it will address itself to the eye of the engineer with more force than will the passive target standing in any given position; the engineer will moreover expect the movement and will look at the target until it moves; whereas if he sees the target as he supposes set "right" for him, he may go ahead without giving it a second glance, when the second glance would show him that his first look had deceived him. But even when the target is moved directly before the engineer's eyes, he sometimes, if his mind is preoccupied, does not actually see it, as was the case at the crossing in Michigan before mentioned.

(f.) Where a crossing is approached by a heavy descending gradient, a telegraph signal station should be established on or beyond the gradient, at a distance of a mile or more from the crossing; then when the man at the crossing wishes to pass a train of the intersecting road he will telegraph the man at the station aforesaid, who will block the line at his station until he receives signal that the crossing is clear.

Whenever a train approaching the crossing passes the signal station, the operator stationed there will notify the man at the crossing, who will of course then refuse the crossing to the intersecting road until after the train of which he has received notice shall have arrived and stopped near the crossing.

This arrangement will cost, for signal house, etc., at least half as much as a box car, and perhaps \$1,000 per year for extra men, but this money will be well invested if it saves a collision once in five or six years.

It has been suggested here that all signal stations at crossings should be made telegraph stations, and that the signal men at the crossings should be "operators," and I fully agree with the gentleman making that suggestion in his estimate of the advantages that would be gained by establishing such stations.

I do not imagine that I have in this paper brought to your attention many facts of essential importance with which you were not more or less thoroughly acquainted before the paper was written, but I hope that our consideration of the facts herein presented, assembled and arranged in a certain order according to the relation that they have one to the other, may result in some good to the service of the line.

I know, from your unanimous expression of opinion given at a late meeting, that you agree with me in saying that the "running" of crossings, heretofore not infrequent on this line, as well as on some other roads, ought to be, as it certainly may be, absolutely stopped.

Under the operation of the semaphores now in use on this line we are as free from accidents at crossings as is any road in the country; still, collisions at crossings do sometimes take place.

I have heretofore called the attention of some of the gentlemen here present to a mechanical contrivance, by the use of which the approaches to the crossings on either road are effectually blocked whenever the apparatus is set for passing a train on the other road; so that a collision on the crossing of trains of the intersecting roads is a physical impossibility. But I would not now strenuously advocate the use of this contrivance (which would be costly in construction, though inexpensive in operation when once built), because I believe that by the use of proper, inexpensive means we may avoid accidents.

Let the fog or snow be as thick as it may, every experienced engineer knows, within a few hundred feet, where he is, in approaching a crossing, and can (except in cases of breakage or insufficiency of engine and train apparatus before spoken of) come up to the stopping-posts, established as before suggested, with his train fully under control. If we put brilliant lights on the stopping-posts at night, they will be discernible at a considerable distance in the thickest weather. Then, the rule being in force that every engine must stop at the post, I advise that the watchman at the crossing be required to go to each engine in turn and to get on the engine and pilot the engineer over the crossing; and that no engine be allowed to pass the crossing unless with the duly uniformed and badged watchman on board.

It will be necessary, perhaps, to modify the general rule so as to adapt it to use in yards, but the pilot should always be on or with the crossing engine.

There need be no loss of time under this arrangement. The watchman will have less than 100 feet to walk from the crossing to the engine, and he will leave the engine as soon as it is over the crossing-plate, and remain at the crossing until the train attached to the engine has passed.

* This rule is now in force on the Atlantic & Great Western Railroad